INVESTIGATING "INTERCONSULTAS":
A MIXED-METHODS STUDY OF PEDIATRIC PATIENT ATTENDANCE IN SANTIAGO, CHILE

by
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Abstract

Statement of problem: While missed health care appointments can lead to wasted health system resources and long-term poor health outcomes particularly in children, few studies have comprehensively explored pediatric patient attendance and mechanisms for improving attendance.

Methods: This mixed-methods study sought to capture the health beliefs, characteristics, and opinions associated with pediatric patient attendance at a public referral hospital in Chile, and evaluate whether Health Call, an interactive appointment reminders system, could improve attendance. After testing the reliability and validity of an adapted Health Belief Model in a subset of the guardian participants (N=295), the relationship of these patient and guardian characteristics with attendance were then analyzed using regression models for all patients enrolled in the study (N=513). Next, differences between attendance outcomes from guardians randomized to a Health Call reminder (N=107) compared with no call (N=156) were compared with the system's performance in actual use across multiple visits. Finally, in-depth interviews were conducted with guardians (N=12) as well as administrators, clinicians, and other staff from around the health system (N=12), to complement and contextualize quantitative results, as well as better understand referral appointment processes and decisions.

Results: With the exception of some appointment characteristics and a few health beliefs, most patient, guardian, and appointment characteristics, were not associated with attendance at referral appointments. No attendance differences were detected in the randomized trial. However, observational data showed that when implemented at scale, the reminder system improved attendance for guardians who received the reminder and

confirmed their appointment. The interviews revealed important differences between the fluid family, health, and situational constraints that guardians noted drove attendance decisions and the fixed value assigned to these referral appointments by the front line, primarily non-clinical staff members who controlled the many different appointment allocation policies and reminder systems.

Conclusions: This study challenges prior assumptions about the determinants of pediatric patient attendance and adequacy of existing approaches to missed visits. Results from this study can be used to refine data collection processes, improve referral and scheduling processes, and advance the understanding of pediatric patient attendance in this and similar settings.

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Conflict of Interest Statement[1]

Work under consideration for publication

The Johns Hopkins School of Medicine MD/PhD program, the Department of International Health at the Bloomberg School of Public Health, provided Evan Rusoja (ER) with salary support throughout his graduate studies including through the duration of this study. The Johns Hopkins University Global mHealth Initiative provided $2,000 which supported Rafael Alaniz during the data collection period. Hospital Luis Calvo Mackenna contributed the expertise and assistance of their health informatics unit throughout the study. Merlin Telecom provided the Health Call system free of charge as well as contributed approximately $5,000 of general study funds.

Relevant financial activities outside the submitted work.

Integramedica and Clinica Indisa, private Chilean health networks, have previously contracted ER to analyze patient attendance across their health facilities. Merlin Telecom used the results from these analyses to develop interventions aimed at reducing attendance. All consultancies fees generated through these projects were used for study funds as well as to offset the travel costs incurred by the study team. ER neither participated in subsequent partnership nor has any financial stake in any ongoing interventions including the Health Call system evaluated in this study. In the early phases of study design, Inti Paredes was part of the study team as the local Co-Investigator and Study Manager while also being a paid consultant for Merlin Telecom. He assisted with organizing meetings with local stakeholders, document translation, and navigating the local ethical approval process. Around the implementation phase of the trial, he subsequently became employed by an unrelated company and the majority of his functions were assumed by ER. Neither he nor the study funders played a role in study design, data collection, analysis or preparation of this thesis.

Relationships not covered

Mauro, Mario, and Marcelo Arancibia (Merlin Telecom) are family friends of ER's partner, Alicia Rusoja, which is how they initially approached ER with the idea of conducting an evaluation of their Health Call system. Results from this study have generated a fellowship program called the Arancibia Fellowship for Health, Technology, and Social Change. The Fellowship brings together representatives from Hospital Luis Calvo Mackenna, Merlin Telecom, the School of Public Health at Universidad de Chile, and the Johns Hopkins University Global mHealth Initiative with the goal of developing technology that meets social needs in Chile. ER is the project founder and director. The project has been supported through a grant from the Global mHealth Initiative and is in its first cycle. More information on the Fellowship is available here: https://fellowarancibia.wordpress.com/fellowship-arancibia/.

Table of Contents

[1] The following statements are prepared in accordance with the conflict of interest guidelines proposed by

Acronyms

Failure to attend (FTA)
Fondo Nacional de Salud (FONASA)

Hospital Clínico San Borja Arriarán (HCSBA)
Hospital Luis Calvo Mackenna (HLCM)
Interactive Voice Response (IVR)

List of Tables

List of Figures

List of Appendices

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Chapter 1: Literature Review

Scope of the Problem

Missed health care appointments present a serious challenge to patient care. For the health system, patient failure to attend (FTA) has a significant impact on efficiency, both in terms of reduced ability to meet standards of care and the resulting potential for underutilization of system resources. Estimates of the number and impact of missed appointments in the United States range from single digit to half of all appointments with considerable variation by facility, insurance type, care setting, age, diagnosis and other strata(George & Rubin, 2003; Samuels et al., 2015). The economic impact of these missed visits for the various health systems combined with their downstream health complications is likely in the hundreds of billions(Sviokla, Schroeder, & Weakland, 2010). Studies of the National Health Service in the United Kingdom suggest that 5-15 million general practitioner visits and 5 million nurse visits are missed each year at costs ranging from several hundred million to over one billion dollars(BBC, 2009; Gurol-Urganci, de Jongh, Vodopivec-Jamsek, Atun, & Car, 2008; Hassin & Mendel, 2008; S. Martin, 2012). At one public pediatric facility in Chile, FTA has been estimated at 20-30% although the scope of the problem elsewhere in the Chilean health system remains unknown(Lastra, 2013). While posing an important problem, there are few studies that comprehensively explore why patients attend, the factors that may relate to attendance, and the mechanisms for improving attendance.

For government funded public health systems like that in Chile, the fiscal impact of missed appointments FTA is significant yet this is not its only effect on healthcare. For

healthcare facilities, missed appointments cause decreased revenue, inefficient use of resources, and additional workload (Weingarten, Meyer, & Schneid, 1997). While FTA at the health system level may be more stable, reflecting the sheer size of patient populations covered, FTA at the facility level can be more erratic as departments within a single facility may vary significantly in attendance patterns and reasons for missed visits (Cayirli & Veral, 2003). For most specialties and departments, scheduled services, ranging from check ups to surgery, provide both an important source of revenue to the system and an entry point for future outpatient and inpatient encounters.

Patients, while often considered the culprit in missed appointments, may be the most affected group. For patients, a missed appointment may mean a disruption of ongoing monitoring for a medical condition, repeated rounds of diagnostic testing, incomplete treatment, reduced health outcomes through delayed care, or damage to the doctor-patient relationship (Humphreys, 2000; Kalb et al., 2012; Mirotznik, Ginzler, Zagon, & Baptiste, 1998; Pesata, Pallija, & Webb, 1999). Patient attendance is associated with reduced medication adherence, suggesting the impact of missed appointments goes beyond the facility visit. Depending on the context, patients may incur additional financial losses due to FTA penalties, missed work, and a variety of other costs associated with complications and additional health care needs for delayed or untreated health issues. Missed appointments are potentially detrimental to other patients as well; an unattended appointment may be a lost care opportunity for another patient (Macharia, Leon, Rowe, Stephenson, & Haynes, 1992).

Key Factors in Missed Appointments

Patient attendance, particularly for pediatric patients, is complex given that multiple patient, guardian, household, appointment, and health system factors have been suggested to influence it.

Guardian and Household Factors

Characteristics of the child's parent or caretaker are important for determining healthcare utilization patterns and health outcomes for dependent children (Bates, Fitzgerald, Dittus, & Wolinsky, 1994; Markowitz, Volkening, & Laffel, 2014). For guardians, logistical issues including having trouble getting or making time for an appointment, finding care for other children, taking time off of work, language barriers, and transportation challenges have been reported as hindrances to appointment attendance (Campbell, Chez, Queen, Barcelo, & Patron, 2000; Collins, Santamaria, & Clayton, 2003; Mohamed & Al-Doghaither, 2002; Paul & Hanna, 1997; Pesata et al., 1999; Smith, Highstein, Jaffe, Fisher Jr, & Strunk, 2002).

Health status plays a unique and complex role in FTA. Where resolving disease may lead many patients to skip future appointments, the relationship between health status and attendance is multifactorial with symptoms and disease resolution, whether definitive or temporary, impacting attendance behavior (Cashman, Savageau, Ferguson, & Lemay, 2004; Kane, 1991; Killaspy, Banerjee, King, & Lloyd, 2000; Lloyd, Bradford, & Webb, 1993; Michel et al., 2011; Richardson, 1998; Van Baar et al., 2006). In the case of

pediatric patients, the relationship between patient health status and appointment attendance may be influenced by both patient and guardian beliefs about health status and the health system (Al-Faris, Abdulghani, Mahdi, Salih, & Al-Kordi, 2002; Michel et al., 2011; Mirotznik et al., 1998; Roden, 2004). The beliefs have been hypothesized to influence behaviors, adherence (Al-Faris et al., 2002), and even future health beliefs and later behaviors as an adult (M. H. Becker, Nathanson, Drachman, & Kirscht, 1977). Concerns about the appointment (Grunebaum, Luber, Callahan, & Leon, 1996; Wogelius & Poulsen, 2005), perceived quality of care, convenience of the appointment, and the physical facilities also potentially influence attendance (Chung, Wong, & Yeung, 2004).

Health beliefs, including parental involvement and belief in disease threat (Irwin, Millstein, & Shafer, 1981), agreement with their doctor's diagnosis (Grover, Gagnon, Flegel, & Hoey, 1983; Vikander et al., 1986), motivation, level of involvement in care, perceptions of their child's current health and susceptibility to illness, concern over potential treatment side effects, as well as potential negative health outcomes, have also been proposed by researchers as important determinants of appointment attendance (Al-Faris et al., 2002; M. H. Becker, Drachman, & Kirscht, 1974; M. H. Becker, Maiman, Kirscht, Haefner, & Drachman, 1977; M. H. Becker, Nathanson, et al., 1977; Samuels et al., 2015). However, the strength and direction of the relationship between guardian beliefs and actual adherence for the pediatric patient has not been consistent across studies (DiMatteo, Haskard, & Williams, 2007; Irwin, Millstein, & Ellen, 1993). Finally, forgetting about an appointment, itself a result of multiple complex interactions, was one of the most common reasons found in the literature for missing an appointment (Carrion,

Swann, Kellert-Cecil, & Barber, 1993; Gurol-Urganci et al., 2008; Herrick, Gilhooly, & Geddes, 1994; Hon, Leung, Wong, Ma, & Fok, 2005; Hull, Alexander, Morrison, & McKinnon, 2002; Mohamed & Al-Doghaither, 2002; Murdock, Rodgers, Lindsay, & Tham, 2002; Neal, Hussain-Gambles, Allgar, Lawlor, & Dempsey, 2005; Pal, Taberner, Readman, & Jones, 1998; Potamitis, Chell, Jones, & Murray, 1994; Richardson, 1998; Samuels et al., 2015; Skaret, Raadal, Kvale, & Berg, 2000; Zailinawati, Ng, & Nik-Sherina, 2006).

Pediatric Patient Factors

Many of the studies reviewed addressing FTA in national and local health systems implicitly merge pediatric patient and guardian factors by assuming attendance is primarily dictated by guardian and household factors. A few studies have examined pediatric patient factors and found that gender (Markowitz et al., 2014; Shaffer et al., 2016), health insurance status (Canizares & Penneys, 2002; Iben, Kanellis, & Warren, 2000; Kalb et al., 2012; Majeroni, Cowan, Osborne, & Graham, 1996; Shaffer et al., 2016; Weingarten et al., 1997; Yoon, Davis, Van Cleave, Maheshwari, & Cabana, 2005), health system utilization over time (McClure, Newell, & Edwards, 1996), and health status influence attendance (Cashman et al., 2004; Kane, 1991; Killaspy et al., 2000; Richardson, 1998; Van Baar et al., 2006).

Patient age has a complex relationship to attendance with some studies finding age to have no relationship with attendance while others have found conflicting trends (Kalb et al., 2012; Markowitz et al., 2014; Samuels et al., 2015; Shaffer et al., 2016). Studies

focused on younger children's attendance generally found that children have limited input on determining appointment attendance (Dini, Linkins, & Sigafoos, 2000; Irigoyen, Findley, Earle, Stambaugh, & Vaughan, 2000; Larson, Olsen, Cole, & Shortell, 1979; Lieu, Capra, Makol, Black, & Shinefield, 1998; Taylor & Cufley, 1996; Winston, Mims, & Leatherwood, 2007). However, with age and increasingly mobility may come lower attendance rates (Lloyd et al., 1993), as well an increased role in decisions that impact health status such as treatment adherence (M. Becker et al., 1978; M. H. Becker, Drachman, & Kirscht, 1972). Thus, as pediatric patients become more independent and as their beliefs and decision-making capacity become more developed, they may be able to increasingly influence their healthcare use (Anderson, Auslander, Jung, Miller, & Santiago, 1990; Kalb et al., 2012; Shaffer et al., 2016; Varni, Limbers, & Burwinkle, 2007).

Appointment and Facility Factors

Appointment attendance is also likely related to the format of appointments in the health system. Problems with scheduling (King, David, Jones, & O'Brien, 1995; Pesata et al., 1999; Ross et al., 1995), administrative issues (Hull et al., 2002; Potamitis et al., 1994), the location of care (Gurol-Urganci et al., 2008; Lasser, Mintzer, Lambert, Cabral, & Bor, 2005; Specht, Powell, & Dormo, 2004), the appointment time (Kalb et al., 2012), and long waiting times for a follow up appointments have been associated with decreased attendance (Chung et al., 2004; Grunebaum et al., 1996; Hamilton, Round, & Sharp, 2002; Kalb et al., 2012; Livianos-Aldana, Vila-Gomez, Rojo-Moreno, & Luengo-Lopez, 1999; Pesata et al., 1999). These may not be uniquely health system factors, however, as

patient perceptions of the scheduling process can lead patients to schedule or cancel appointments in ways that significantly impact health system resource allocation (Lacy, Paulman, Reuter, & Lovejoy, 2004). Literature on provider type and specialty also indicate a degree of influence, which may represent some combination of the visit format, urgency, provider type, ease of access, and/or level of acuity (Alvarado, Vega, Sanhueza, & Muñoz, 2005; Bottomley & Cotterill, 1994; Kalb et al., 2012; Lloyd et al., 1993). Relationships with providers were also found to be relevant, where poor continuity and perceptions of not receiving important health information were both associated with reduced attendance (Irwin et al., 1993; Van Baar et al., 2006). Being able to discuss problems with their physician was associated with increased attendance(Lloyd et al., 1993) whereas poor communication between the patient and provider may result in negative experiences and missed appointments (Bottomley & Cotterill, 1994; Husain-Gambles, Neal, Dempsey, Lawlor, & Hodgson, 2004; Lloyd et al., 1993; C. Martin, Perfect, & Mantle, 2005).

Several conclusions can be drawn from studies of patient attendance. First, even when single factors are associated with attendance, they do not uniquely determine attendance. The decision to attend is inherently multifactorial, reflecting a complex web of individual, guardian, household, appointment, and facility factors (Lacy et al., 2004). Second, decisions to attend appointments are likely influenced by a wide variety of beliefs about health and the health system. Third, determinants of attendance themselves change over time and in relation to experiences with the health system.

Interventions to Reduce Missed Appointments

Healthcare organizations have developed a variety of strategies for dealing with missed appointments, which are generally focused on increasing the attendance likelihood of individual patients or of a group of patients. Clinicians are generally expected to see an uncertain number of patients in a fixed time slot, creating delays in care for waiting patients, reduced appointment time per patient and frustration amongst overworked care providers (Hasvold & Wootton, 2011; Lacy et al., 2004; Zeng, Turkcan, Lin, & Lawley, 2010). Ultimately, strategies to address missed appointments may have only limited impact on diminishing the unpredictable patterns of attendance.

Reminder Systems' Effectiveness in Reducing FTA

In addition to scheduling strategies (Cayirli & Veral, 2003), providers and facilities around the world have adopted a host of reminder systems acknowledging that, while some portion of missed appointments may be unavoidable, others may be reduced by intervening ahead of the appointment (Mitchell, 2007; Tierney et al., 2003).

In a review of interventions aimed at reducing FTA rates, Marcharia et al. found that letter and telephone interventions, provider orientation materials or media, contracts, and physician prompts were all effective(Macharia et al., 1992), as did a study of mental health facility attendance by Lefforge et al. studying the impact of letters, automatic and manual phone reminders, mailed reminders, and/or therapy (Lefforge, Donohue, & Strada, 2007). A Cochrane review by Gurol-Urganci et al. found that across the 8 randomized controlled trials reviewed, text messages had a similar impact as phone calls

on attendance with both outperforming overall attendance compared with no reminder (78.6% vs. 80.3% vs. 67.8% respectively) (Gurol-Urganci et al., 2008). More recently, Hasvold and Wootton reviewed reminder systems interventions and found that, aggregated across the 33 studies they reviewed from the 2000s, all but one study showed significant differences. This difference was bigger for manual calls which provided a larger relative reduction in missed appointments compared with SMS or automated calls (39% vs. 29%) (Hasvold & Wootton, 2011). As a whole, reminder systems do appear to improve attendance but, with the many options available, the choice of intervention may be dictated by health system goals and resource constraints.

While many reminders have been recommended to improve attendance across a variety of appointment types, they also have limitations(Szilagyi et al., 2000; Zailinawati et al., 2006). Reminders often face trade offs in relation to timing, privacy, clarity, confidentiality, and cost (Gurol-Urganci et al., 2008). Manual reminders, such as face to face contact, letter writing or personally delivered phone calls do not necessitate access to technology but may require more staff time and money than are available (Irigoyen et al., 2000). Multi-method approaches, such as letter and telephone reminders(Lieu et al., 1998) or postcard and telephone outreach(Irigoyen et al., 2000) have also been proposed as effective yet have the same limitations. Automatic health technology interventions like web, email, and SMS/MMS may be as effective as manual reminders but reduce the cost per reminder message (Chen, Fang, Chen, & Dai, 2008). The notion that these interventions apply only to high resources settings has been challenged. Emerging evidence from research in low resources settings suggests that SMS, automated

reminders, and other health technology interventions represent potentially important but still under-assessed ways to impact knowledge, behavior, and outcomes (Beuermann et al., 2015; World Health Organization, 2015).

Hybrid solutions, those merging features of manual reminders with computer technology, are also gaining prominence. Building off of the auto calling functionality of some initial computer based systems that call and deliver a pre-recorded message, interactive voice response (IVR) systems, have been developed to take advantage of the best features of manual reminders while offering the functionality of computer based systems. IVR can screen recipients using security screening questions at the beginning of calls and be accessed on all types of phones, an advantage compared with text and email messages that may be inaccessible depending on literacy, computer/mobile phone access, and vision. A review by Corkrey et al. and work by others has found IVR to show improvements in appointment attendance, treatment adherence across a variety of medication types preventive service use, substance abuse behavior modification, and exercise capacity (Bender et al., 2010; Corkrey & Parkinson, 2002; Crawford et al., 2005; David et al., 2012; Stacy, Schwartz, Ershoff, & Shreve, 2009; Tucker, Roth, Huang, Crawford, & Simpson, 2012). IVR systems have not been effective in administration of surveys(Rodriguez et al., 2006) or medication refill compliance (Reidel, Tamblyn, Patel, & Huang, 2008). Additional proposed benefits from IVR include the potential for expanded patient contact, reduced staff workload and greater efficiency than manual interventions (Bender et al., 2010; H. Lee, Friedman, Cukor, & Ahern, 2003; Oake, van Walraven, Rodger, & Forster, 2009; Stacy et al., 2009) although these may be offset by

the quality and complexity of the voice recognition algorithm, the technical capacity and knowledge of the staff and unnatural interface for some users (Abu-Hasaballah, James, & Aseltine Jr, 2007). These factors may contribute to the lower effect size seen with some automated reminder systems as compared to manual reminders (Hasvold & Wootton, 2011). As a patient-provider interface, IVR may overcome some of the constraints associated with both traditional and automatic reminder system while still providing FTA rates (Crawford et al., 2005).

From the perspective of the facility and health system, IVR may also have advantages because it has been shown to reduce the costs and human resources needed to administer reminders. Lieu et al. conducted a randomized controlled trial on the effects of automated telephone messages alone, letters alone, letters followed by a call one week later, and a call followed by a letter one week later on immunization status of young children in California, USA, and found that a letter followed by an automated message was more cost effective than either intervention alone, although automated messages were equivalent to letters in effectiveness and superior in terms of cost effectiveness (Lieu et al., 1998). Other studies have found a single mailed reminder provided a higher return on investment than a mail reminder plus phone call combination (Irigoyen et al., 2000). While mailed reminders may be more cost-effective in some circumstances, they place the burden of responsibility of rescheduling appointments on the person receiving the reminder. Actual calls, as opposed to written reminders, may offer patients the opportunity to reschedule immediately, thus ensuring continuity of care for the patient

and an opportunity for another patient to use that open appointment slot (Hashim, Franks, & Fiscella, 2001).

These patient reminder interventions have important limitations. A review and accompanying simulation by the authors found that many studies are limited to specific clinics; model attendance was often based on the assumption that each patient sees a specific physician and thus failed to factor in outpatient clinics that accommodate walk-in or emergency visits; few models incorporated the "cost" of attendance to patients such as wait times; and few attendance interventions are evaluated in actual practice. Modeling assumptions posed an important problem to implementers as decisions about how to best allocate appointments (block, interval, combination), the mix of patient types (demographic, department, visit type) and contingency algorithm (overbooking, changing appointment times, considering emergent/walk-in appointments), differ by facility and therefore limit the generalizability of system results (Cayirli & Veral, 2003).

Furthermore, these studies often focus solely on provider, facility or health system perspectives, potentially failing to take into account the many patient and family perspectives that may mediate the impact of manual and health technology interventions (Berg et al., 2013; Cayirli & Veral, 2003; Gentles, Lokker, & McKibbon, 2010). Finally, though intervention studies are useful for understanding potential impacts of appointment reminders they rarely are accompanied by information on factors associated with attendance, an issue that limits the utility of results.

Conceptual Framework

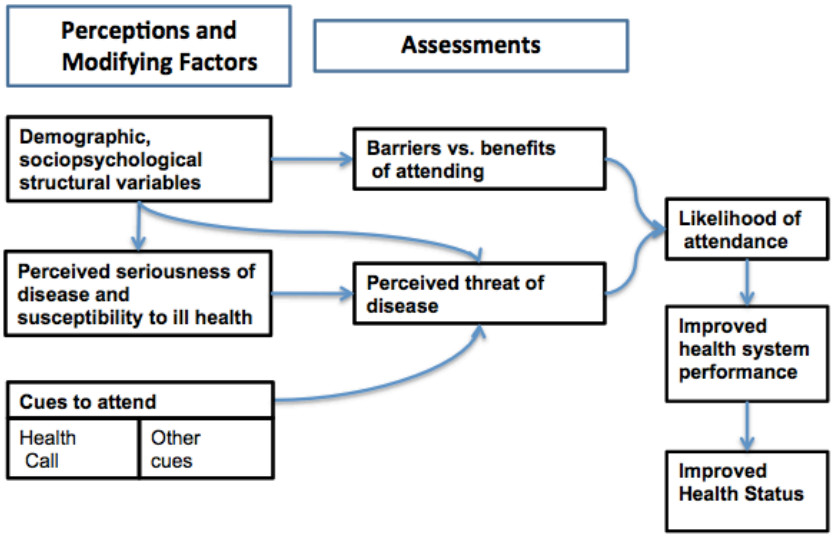
A unified framework that details potential relationships between reminder systems and factors associated with patient attendance is necessary for guiding the evaluation of patient reminder systems and their impact on attendance. The conceptual framework for Investigating Interconsultas builds on the Health Belief Model (Irwin M Rosenstock, 1966; I.M. Rosenstock, 1974) using it to frame the study on pediatric patient attendance and therein identify potential relevant variables or constructs for analysis.

The Health Belief Model

The HBM was originally developed to explain behaviors related to preventive health services use in the United States(Irwin M Rosenstock, 1966; I.M. Rosenstock, 1974) but has since been applied widely to other types of health behaviors including appointment attendance (Carpenter, 2010; Janz & Becker, 1984; Mirotznik et al., 1998). The HBM is premised on a multi-phase process where perceptions and modifying factors influence assessment of barriers and benefits, as well as the perceived threat, and result in a likelihood of performing a recommended action such as appointment attendance (**Figure 1**). The perceived threat within this model include severity of the disease and susceptibility to ill health. Modifying factors include patient and guardian characteristics, social and cultural values factors (Finney Rutten & Iannotti, 2003), and structural variables like health motivation, peer behaviors wider social expectations, and appointment and facility factors (Finney Rutten & Iannotti, 2003; Fulton et al., 1991; Janz & Becker, 1984; Soliday & Hoeksel, 2001). Now with fifty years of theoretical and

implementation literature, the HBM provides a useful but not wholly explanative framework for attendance.

Figure 1.1: Health Belief Model



A meta-analysis by Carpenter of 18 studies between 1982 and 2007 that used the HBM to understand diverse behavioral outcomes, found that although the HBM has been one of the most frequently used models for understanding behavior, many dimensions of the model remain unproven. In the analysis, severity and susceptibility each were seen most strongly to correlate with adherence to prescription medication, although each individual relationship was weak. Perceived benefits had a consistently positive relationship with behavior while barriers was the belief most strongly related to outcomes, particularly preventive as opposed to curative actions. With the exception of barriers, these relationships were found to fade over time, suggesting that the longer the duration between HBM measurement and behavior, the less consistent the link. The author notes that these results call into question the relationship between HBM factors and outcomes

but that many of the underlying studies were single item measures, did not perform psychometric analysis to test for appropriate use, or offered models that were too simple to adequately isolate effects had they been present (Carpenter, 2010). This analysis also excluded studies designed to impact underlying HBM factors, leaving open the possibility that changes in these beliefs relate to behavior or outcomes.

A subsequent systematic review by Jones, Smith, & Llewellyn looked at 18 studies of HBM based interventions using data from model conception to 2012. These researchers found that most studies demonstrated an impact of these interventions, particularly on primary prevention, but that the influence was not necessarily related to specific changes in health beliefs (Jones, Smith, & Llewellyn, 2014). Just as in the Carpenter review, these were primarily studies based on adult populations in the United States or in other high-income countries. These studies included limited justification of why certain health beliefs were selected for study or whether they were reliable or valid in the research context, and rarely included subsequent additions to the HBM, such as motivation. Finally, few studies included in either review adequately captured the interface between this framework and the cues believed to impact perceptions, assessments, and behaviors.

According to the original theorists, and to subsequent authors, one of the most under-investigated aspects of the HBM is the cue to attend (Carpenter, 2010; Janz & Becker, 1984; I.M. Rosenstock, 1974). While appointment reminders may act as cues to action (Fulton et al., 1991; Larson et al., 1979; McCaul, Johnson, & Rothman, 2002; Soet & Basch, 1997), and are likely an important determinant of behavior, few studies have

characterized how cues fit into the HBM framework. Oinas-Kukkonen and Harjumaa posit that technology designed to change beliefs or behavior must be developed and analyzed in terms of the persuasion context (what they call the intent, event, and strategy). These reflect how communication strategies are developed and targeted, the health beliefs and characteristics used to interpret messages once received, and finally the strategy with which messages attempt to sway beliefs or behavior (Oinas-Kukkonen & Harjumaa, 2009). Even with a more comprehensive view of the interface between beliefs, characteristics, health technology and patient attendance, many questions remain about how these factors interact to determine outcomes (Carpenter, 2010; Champion & Skinner, 2008; Roden, 2004).

Implications for further study

Although offering potentially promising results, many of the studies looking at attendance alone or in relation to the HBM and at methods like IVR that could improve attendance, have important limitations. Most focus on specific clinics, have small samples, lack a conceptual framework, include only a few confounders which are not appropriately analyzed, use a single, often cross-sectional method of study, and/or are set in high-income, English-speaking, private-insurance settings (Gurol-Urganci et al., 2008; Hasvold & Wootton, 2011; Haynes & Sweeney, 2006; C. S. Lee & McCormick, 2003; Oladipo, Ogden, & Pugh, 2007). Given the impact of FTA on public health systems like that in Chile, implementers must have a clear understanding of the characteristics, beliefs, and experiences driving missed appointments and an understanding of how, through new or existing interventions, patient attendance can be effectively improved.

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Intended to be blank.

Chapter 2. Study Approach

Overview

This study seeks to characterize how health beliefs impact patient attendance and to provide a rigorous, practical evaluation of Health Call system, an interactive, voice response system. This study reflects a multi-year collaboration between Hospital Luis Calvo Mackenna (HLCM) in Santiago Chile, Merlin Telecom, and Evan Rusoja, the study's Student Investigator (**Appendix 2.1**). Using a mixed-methods approach, this study will provide contextualized, triangulated analysis of pediatric patient attendance in Chile which can be used to inform scale up of Health Call or other patient reminder interventions that aim to increase appointment attendance.

Objectives

This study will identify key characteristics and health beliefs associated with missed appointments and assess whether appointment reminders could improve pediatric patient attendance at a referral hospital in Santiago, Chile. Specific aims include the following:

Aim 1: Examine what factors are related to appointment attendance

Aim 1a: Develop and validate a psychometric scale based the Health Belief Model

Aim 1b: Evaluate what patient and guardian characteristics and health beliefs relate to appointment attendance in cross section and over time

Aim 2: Evaluate whether an interactive voice response (IVR) reminder system, Health Call, can decrease the failure to attend (FTA) rate

Aim 3: Investigate patient attendance processes and experiences to better understand the potential impact of interventions on attendance and to provide context to Aims 1 and 2

Analytic Approach

Appointment attendance for pediatric patients can be influenced by a variety of patient, household, and health system factors. Approaches for reducing FTA rates must contend with this complex array of factors while meeting context specific health system limitations. While formative research on IVR has suggested it is potentially effective in reducing FTA rates, its actual efficacy, a picture of health beliefs around attendance, and potential for future interventions remain theoretical. Results of this study will be pertinent for hospital administrators, health technology developers, and health system policy makers particularly in Chile and Latin American settings as they decide how to implement both technology and non-technology solutions to missed appointments and explore larger applications of these systems to other areas of healthcare.

Assessments that use multiple methods, address the concerns of multiple stakeholders, and address multiple outcomes are critical for understanding the impact of health technology (Glasgow, 2007). This process of triangulation, using two or more methods to obtain a holistic view of a given phenomenon (Jick, 1979), is particularly important for evaluating health technology systems because data is needed not only on intervention performance and economic benefit of a system (quantitative measurement) but also on system adoption and usefulness (qualitative measurements) (Kaufman, Roberts, Merrill,

Lai, & Bakken, 2006; Lilford, Foster, & Pringle, 2009). Building an evidence base, which includes effectiveness, cost-effectiveness, and consumer opinion data, offers the evidence needed to apply and scale new interventions (Pagliari, 2007). Through this iterative triangulation implementers and researchers can arrive at a more complete picture of the overall impact of an intervention (Van Der Meijden, Tange, Troost, & Hasman, 2003).

This mixed-methods study seeks to provide a multi-perspective view of pediatric patient attendance and the impact of a new reminder system on missed appointments. A summary of the analytic approach by study aim is provided below. A detailed description of the methodology is provided in the chapter associated with each aim.

Aim 1: A survey tool was adapted to the context based on the Health Belief Model components of the study's conceptual framework, and administered to guardians. Psychometric determinants of attendance were tested for reliability and validity (Chapter 3). Patient, guardian, appointment, and facility characteristics, along with results from this scale, were assessed cross-sectionally and longitudinally to determine factors related to attendance (Chapter 4).

Aim 2: To evaluate if the Health Call patient reminder system is effective in reducing missed appointments, a randomized controlled trial composed of the guardians of patients referred for an appointment at a tertiary care pediatric hospital was carried out. Both trial outcomes and observational data from use of Health Call on a more widespread basis are evaluated (Chapter 5).

Aim 3: Given the complexity of the proposed interactions, study context, and intervention, in-depth interviews were used to complement and contextualize quantitative study results, as well as suggest improvements to the reminder system (Chapter 6).

Setting

Spanning a considerable portion of the western border of South America, including considerable portions of the Andes Mountains, Chile has a diverse environmental and cultural background. Composed of 17.5 million people (21% are children), 89% of Chileans live in urban areas, in particular Santiago, the centrally located capital city(World Health Organization, 2015). Following a politically turbulent mid to late 20th century, Chile transitioned from dictatorship to representative Democracy in 1990. Chile has made considerable strides politically, socially, and economically in recent decades and is now South America's first member of the Organization for Economic Co-operation and Development, although there is a high degree of income inequality with 58% of GDP earned by the wealthiest 20% (Bossert & Leisewitz, 2016; World Bank, 2016). Chile spends 7.4% of GDP on health(Bossert & Leisewitz, 2016). With a 80-year life expectancy, under 5 mortality rate of 8/1,000 live births, a total fertility rate below replacement at 1.8, and a maternal mortality ratio of 22/100,000 live births, Chile has achieved relatively good population health measures(World Health Organization, 2015).

Approximately 80% of Chileans are covered by Fondo Nacional de Salud (FONASA), the public health financing body managed by the Ministry of Public Health. The

remaining quarter of Chileans use either public or mixed private-public services. FONASA is divided into 4 levels (A-D) according to socioeconomic status. This system is financed through a combination of State funding and a 7% national tax(Bossert & Leisewitz, 2016; Superintendencia de Salud, 2016).

In the early 2000s, Chile introduced a phased plan for guaranteed health services delivery. Starting with 25 priority conditions, Acceso Universal con Garantías Explícitas (AUGE) has subsequently expanded to include guaranteed access to care for 69 health problems deemed to be priorities based on their importance, effectiveness, health system capacity, costs, and society wide support (Ministerio de Salud, 2013). Services that cannot be obtained within a condition specific time period are outsourced to a private provider and financed by FONASA (Missoni & Solimano, 2010). While a significant step forward in terms of providing healthcare, AUGE and other reforms have put hospitals under pressure. Since tertiary care facilities like HLCM are responsible for a set number of patients and their annual budget is adjusted based on the number of patient visits, missed visits have important operational and fiscal implications. First, since AUGE guarantees a physician contact for many qualifying conditions within a set time period, a missed appointment means HLCM has to guarantee another appointment within a certain time period or pay for an outside consultation. In this scenario, the initial cost of the idle physician time is added to the additional cost of the second, either internal or external, visit. Second, the hospital is also responsible for taking patients from the waiting list (reported to be nearly 80,000), which is possible if open appointment slots are identified ahead of time but not if administrators don't have advanced notice that an appointment

will be available. With both financial and logistical pressure to reduce missed visits, HLCM and other facilities in Chile are seeking to reduce FTA.

HLCM is a pediatric tertiary care center located in Santiago, Chile. Receiving over 60,000 patient contacts each year, HLCM is one of the most important pediatric care centers in Chile and the highest level of care available to many of the country's pediatric patients. The hospital itself is comprised of 41 departments including in-patient and out patient departments, an emergency room, labs, and hospital administration. Over the past few years, HLCM, along with other similarly sized facilities in Chile, have implemented an electronic medical record system.

Referral appointments at HLCM consist of emergency room admissions, internally referred patients and patients from geographically distinct administrative units or "Centros de Atención Primaria Municipalizada." Each administrative unit is led by a director and is composed of several basic health facilities or "consultorios" which refer patients directly to HLCM.

Intervention

The Health Call system (**Appendix 1**) is an interactive, voice response system. Using patient appointment data extracted from an electronic medical record, Health Call contacts patients using a fully integrated internet phone and, after a short greeting and identity confirmation process, delivers either an appointment reminder or connects rescheduling patients to a hospital voicemail service. For those rescheduling, voicemails

are received by the hospital staff, who then contact patients for follow up changes to their appointments.

Study Design and Procedures

Sample Size Calculations

Sample size was calculated using historical data based on recruitment goals for the randomized controlled trial arm of the study (Aim 2, Chapter 5). A Power of 80% and α=5% were used along with data available from HLCM during the reference period (January 1- May 20, 2013) suggesting the average FTA rate was 22.4%. While the study sought out to detect a difference in the FTA rate of ≥10%, at the time of analysis, the sample size was only sufficient to detect a different of ≥15% **(Table 2.1)**.

Table 2.1. Total Sample		
Overall FTA	10.0%	15.0%
20.0%	504	202
22.4%	564	232
25.0%	621	260

The planned sample was 564, which was based on the sample size calculations presented above and included a 15% accounting for the patients who had appointments beyond the analysis cutoff

Study Locations and Eligibility

As one of Chile's main hospitals, patients from virtually anywhere in the country can be referred to HLCM, although most patients live in the Eastern part of Santiago's "metropolitan area" (**Appendix 2.2 and 2.3**). Accordingly, only administrative units that

accounted for more than 2% of referrals to HLCM during the reference attendance period (January 1- May 20, 2013) were considered eligible. Six of the seven communities, and their accompanying facilities that met these criteria, consented to participate in this study (Las Condes declined participation). These six communities and their 16 consultorios accounted for 82.8% of the 11,490 referrals to HLCM during the 97 day reference period (**Table 2.2**).

Table 2.2: Enrollment by Study Community

Community	Planned	Enrolled
La Reina	7.0%	10.6%
Penalolen	42.1%	47.4%
Providencia	8.2%	8.4%
Macul	19.8%	13.6%
Lo Barnechea	6.6%	9.0%
Nunoa	14.9%	11.0%
TOTAL	100%	100%

At the 16 participating facilities, a convenience sample of all eligible participants was used. Eligible participants were the guardians of patients 18 or younger who received a referral to HLCM, had a phone number, were sufficiently proficient in Spanish to complete the study questionnaire in written or oral form, and for whom no one else in the household was participating in the study. With the exception of the previous household participant criteria, eligibility parameters were identical to the criteria required to receive a referral appointment. Emergency room visits were not included in the analysis.

Enrollment and Consent

Screening occurred at the participating facilities. As the scheduling of a follow up appointment at HLCM took place, the secretary at each consultorio provided guardians with a copy of the Health Call recruitment script. The recruitment script described the study and pertinent contact details. The secretary would briefly described the study and eligibility criteria to the guardian and inquire as to whether they would be participating. If they qualified for the study, guardians could proceed with consent and the questionnaire; an assent document was also used for minors aged 8-18 year old.

Guardians of pediatric patients were the target of the study as they were likely responsible for determining pediatric patient attendance. However, the study also collected data regarding the pediatric patients in their care. Accordingly, the recruitment process included a partial or complete assent process during enrollment depending on the age of the child:

Ages 0 to 7: parental consent, including a brief statement about the intent to collect data about the child.

Ages 8-18: parental consent plus a separate oral assent completed by the guardian and/or the study staff member. This assent process provided an abbreviated and age appropriate description of the study, which the guardian may provide to the accompanying child. Since the consent and questionnaire were self-administered, confirmation from the guardian of the administration of assent to eligible children was not required.

Guardians could either enroll with the help of a study staff member in the clinic (when available), self administer the consent and questionnaire and deposit them into a secure study box, or fill out a contact card and deposit it into the same collection box requesting a call back from study staff for enrollment over the phone.

Data Collection

Guardians (or study staff when completed over the phone) filled out the Guardian Consent and a Patient Identifier Form which included Chilean Medical ID, education status, work status, patient name, patient Chilean Medical ID, relationship to patient, phone number, primary user of this phone, and secondary phone number along with primary user. Since guardians had already consented to potentially be contacted, in the interview phase, a Guardian Interview Consent document was used that was specific to this aspect of the study. Staff completed a full Staff Interview Consent document during their interview contact. Interview data collection occurred via phone or in person depending on participant preference and availability. Completed study information was collected from the participating facilities or, in the case of phone calls, was entered directly into the Health Call database. All study materials and procedures including recruitment, consent, questionnaires, and interviews were in Spanish, the official language in Chile.

Electronic information about patients was attained from HLCM and the Health Call Database. Information related to patient appointments, attendance, and some aspects of patient demographics (gender, birthdate, insurance type, appointment type, community of

residence, and information on the referral) come from HLCM records. Using the pediatric patient's Chilean ID number, relevant data was matched to the participant's ID number and imported into the Health Call Database.

The Health Call Database then initiated calls (or no calls) per randomization protocol and imported other available information for some but not all visits, starting in 2011 when HLCM began converting to electronic records. Information such as ICD10 code, specialty, appointment priority level, and number of days spent in the waiting list were collected but were often incomplete. The Health Call Database also was used to attain information on the RCT intervention (including call timing, date, frequency, length of call, and timing of attempts), which were imported directly from the Health Call server at Merlin Telecom to the Health Call Database.

Patient Identifier Forms were stored separate from the questionnaires, in a locked cabinet in a secure area accessible only to study staff. Hard copies of interview notes and recordings were digitalized and transcribed into de-identified audio files and text transcripts (linked only via their Study ID). Both the Health Call and Study databases were stored on a password-protected computer. The Health Call Database, the Patient Identifier Forms, and any other electronic or physical copies of identifiable patient information will be destroyed one year after completion of data collection.

Data Analysis

Data analysis was performed using Stata Version 12 (College Station, TX). Independent variables were divided into guardian, patient, appointment, and facility characteristics (**Table 2.3**). Patient characteristics included gender, age at the appointment (<5, 5-9, and ≥10), insurance type (FONASA level A, B, C, D or other)[2] as a proxy for socioeconomic status (Superintendencia de Salud, 2016), and location measures. Location measures, which included community of residence and referring facility (**Appendix 2**), were hypothesized as proxies for distance and potentially shared characteristics. Guardian characteristics included gender, relationship with the patient (parent or other), highest level of school started or completed (preschool or less, primary or secondary school, or technical school or more), marital status (married or co-habitating, single or widowed, separated or divorced), and employment status (full time, part time, unemployed or head of household). Guardian age was initially collected but discontinued due to the high frequency or missing responses.

Table 2.3: Independent Variables						
Patient	Gender (dich.)	Age at appointment (cat.)	Insurance type (cat.)			
Guardian	Gender (dich.)	Relationship with patient (dich.)	Education (cat.)	Marital status (cat.)	Employment status (cat.)	Community (cat.)
Appointment	Appointment type (dich.)	Appointment time (cat.)	Appointment day (cat.)	Appointment month (cat.)	Total Visits (cat.)	
Facility	Provider type (dich.)					

[2] FONASA level according to monthly income based on March 9, 2016 conversion: A: Indigent or those without income; B: CLP: 250,000 or less (USD: $367.73 or less); C: CLP: 250,000-365.000 (USD: $367.73-$536.87); and D: CLP: 365,001 (USD: $536.87 or more).

At the facility level, the type of HLCM provider (physician vs. other) involved in the referral appointment was analyzed. Information on department was collected but was not used in the analysis (with more than 30 departments and no clear way to aggregate the department counts were small). The intervention assigned group (randomized to intervention vs. control) and actual intervention received (with call answered or missed call received vs. call not made). For the appointment, variables included the appointment type (new appointment which was their first visit to HLCM for a given condition or repeat appointment), appointment time (before 10am, 10:00-11:59, 12:00-13:59, and 14:00 or later), day of the week, and month. Several categories of appointment data were created.

- Trial data was collected at the visit when the patient was randomized to the study or control group (typically the visit following enrollment).
- Cross-sectional attendance data for the next visit after the registration date (first visit after the survey). Attendance data from this visit was used since it was the closest time point to the guardian survey where demographic and health belief information was collected (note that attendance data from this time point was not always used to analyze attendance for the randomized trial).
- Observational/Longitudinal attendance data included appointment attendance information on study participants from several years of HLCM records.

Certain variables were considered constant (ex: guardian characteristics and patient gender) whereas others (ex: patient age, FONASA) may have changed over time and were updated according to available information. The primary outcome was dichotomous

attendance versus not attendance at HLCM. Success was defined as follows: (1) the patient attended any appointment on the indicated day; or, (2) the patient or facility rescheduled the appointment before the appointment date. When two or more visits were scheduled on the same day, it was considered a success if they attended at least one appointment.

Ethical Considerations

This study presented no greater than minimal risk to participants. Recruitment occurred in the facility, thus it is possible other people overheard or inferred that the participant was going to HLCM for a follow up appointment. Since this process was unavoidable, participants were allowed to complete the consent process and questionnaire on their own in a private, pre-designated area of the facility or complete it later over the phone. Thus, this risk was considered minimal. For staff, interviews were conducted either in a private setting in the health facility such as an empty office or over the phone in a private setting of their choosing.

Since facility-based enrollment may have implicitly suggested the survey was associated with the facility, participants may have perceived the study as either mandatory or in some way connected with their care. Similarly, participants in the interviews, which focused on the quality and organization of the health system, may have worried about the potential impact of their opinions on subsequent care.

To emphasize the voluntary nature of the study, the consent and assent clearly indicated that participation was voluntary and would not affect future care.

For study enrollment or contact documents at the health facility, there is the possibility that forms could be taken from the boxes in which patients deposited them. To protect against this risk, a sturdy sealed box with slot for receiving study materials was stationed adjacent to the referral area and monitored by facility staff. Study staff collected materials from the boxes one to five times per week depending on facility volume; in the event they could not come on a given day, a facility staff stored the box in a locked area in the same manner they secured other protected health information.

The Health Call intervention is unlikely to cause harm although the accidental transmission of appointment information could have occurred if someone other than the target guardian were to pick up the call. To minimize this risk automated questions about the patient's birth month and year were used to confirm the identity of the guardian before the appointment confirmation message was delivered. Participants may have incurred the cost of the received call although in Chile most, if not all, incoming calls are free to the recipient. No compensation was provided to the participants in this study.

The study protocol was approved by the Institutional Review Boards of the Johns Hopkins Bloomberg School of Public Health (US) and the Region Servicio de Salud Metropolitano Oriente (Chile) which is responsible for ethical oversight of HLCM and the participating communities/health facilities (IRB 00004109). The study was registered with ClinicalTrials.gov (Protocol Record 00004109). No Data Safety Monitoring Board was established.

Appendices

Appendix 2.1: Study Origin

The Health Call project was initially developed in Chile in 2008 through a partnership between Hospital Clínico San Borja Arriarán (HCSBA), a large public referral hospital in Santiago, and telecom company Merlin Telecom (MT). To cope with health system pressures, particularly related to FTA, hospital directors in Santiago were looking for new ways to improve efficiency and meet patient demand(Paredes, 2011) while leveraging Chile's high level of adult literacy (99%) and high telecommunications access (134 mobile phones per 100 people) (UNICEF, 2015).

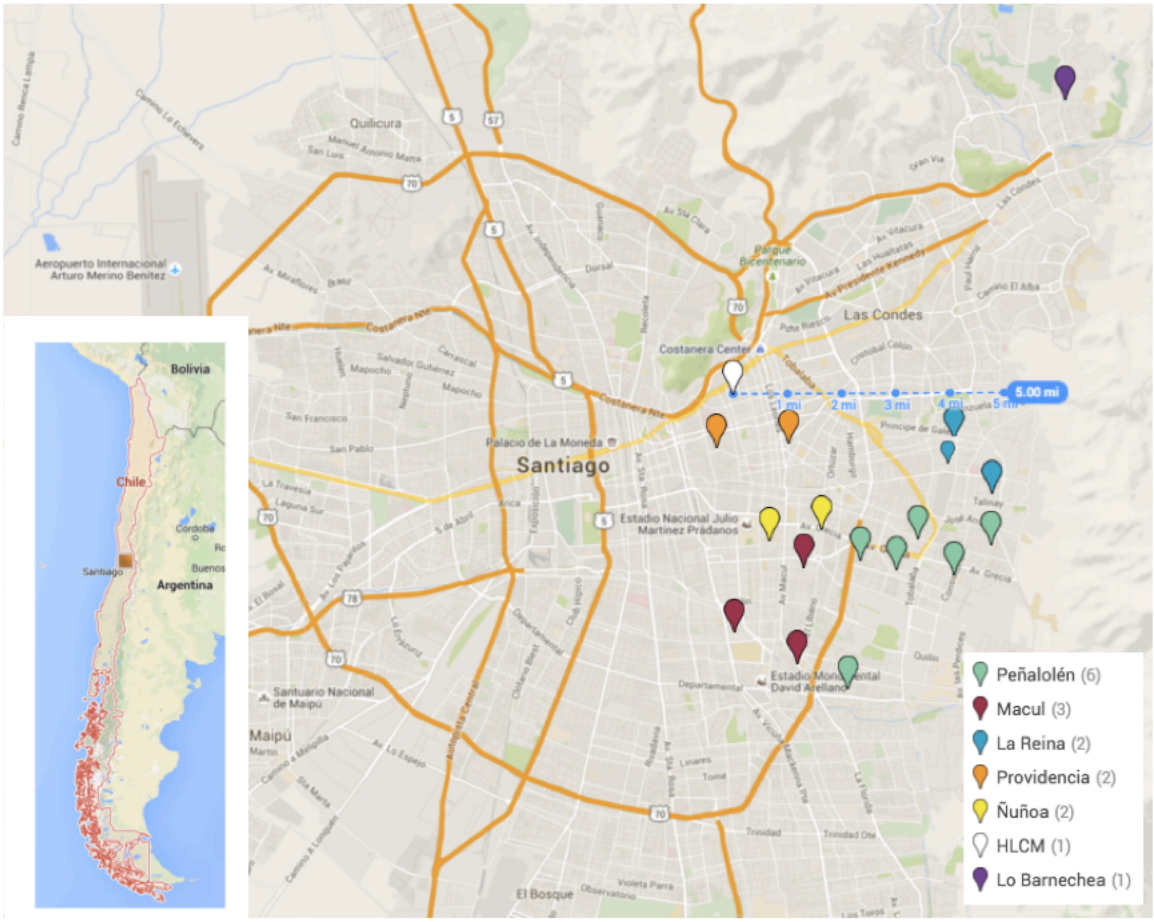
With the objective of reducing FTA rates at HCSBA, then Director Dr Inti Paredes conducted a series of formative studies on ways technology, particularly automated reminder systems, could improve patient attendance. Reasons for non-attendance were examined. Focus group discussions produced many of the known reasons for missed appointments, including forgetting appointment times, the resolution of the health issue, patients received care elsewhere, difficulty traveling, competing priorities, desire for outside advice, and several others. A series of formative qualitative and quantitative investigations with clinical, administrative, patient, and technology stakeholders were then conducted by MT and Dr Paredes which focused on potential solutions for decreasing FTA rates. Recognizing that contacting patients ahead of their appointments could resolve many of these issues, the team developed Health Call.

A subsequent larger pilot was then conducted at HCSBA. This time, the focus was on addressing the feasibility of the intervention, its applicability in the target patient populations, and preliminary modifications of the system. Those with valid contact information (roughly 75% of those in the Chilean electronic medical record) during the four-month trial period were contacted and 86% confirmed that they would attend. Of that 86%, about 4 in 5 patients ultimately attended their appointments. Nearly 1/3rd of pilot participants reported they might not have attended their appointment if it wasn't for the system and nearly all reported a desire to continue receiving reminders.

Following requests from hospital and regional health officials for a formal evaluation of the Health Call system, MT contacted the Student Investigator (Evan Rusoja) regarding the possibility of an external evaluation by the Johns Hopkins Bloomberg School of Public Health (JHSPH). Agreeing to review the potential for study, the Student Investigator conducted initial site visits in 2009 and 2010 and secured faculty support at JHSPH.

After a key staffing change in Chile, the trial site was shifted in mid 2010 from HCSBA to HLCM. After this switch, the Student Investigator conducted a follow up site visit in 2011 with both the MT and HLCM partners to solidify the research goals and methods as well as the staff roles and responsibilities. Since this visit, Merlin Telecom has continued to work with potential end users and the JHSPH research team to improve the call format, voice, timing, user interface, and data collection attributes. These improvements are integrated into the final Health Call system that was utilized in this study.

Appendix 2.2: Study Area and Clinics[3]



Appendix 2.3: Clinics by Study Community						
La Reina	Ossandon	Juan Pablo II				
Penalolen	Cardenal Silva Henríquez	Carol Urzua	La Faena	Lo Hermida	Padre Gerardo Whelan	San Luis
Providencia	El Aguilucho	Hernan Alessandri				
Macul	Dr Felix De Amesti	Padre Alberto Hurtado	Santa Julia			
Lo Barnechea	Lo Barnechea					
Nunoa	Rosita Renard	Salvador Bustos				

[3] Google Maps. (2016). [Santiago, Chile with consultorio layer designed by Evan Rusoja] Retrieved on March 9, 2016 from: https://www.google.com/maps/d/edit?mid=zbG_u8e4315s.kKCggj4JvgnA&usp=sharing

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Chapter 3: Measuring Health Beliefs: The reliability and validity of an adapted Health Belief Model questionnaire in Santiago, Chile

Health Beliefs

Health beliefs have been widely hypothesized to influence health behaviors including patient attendance (M. H. Becker, Drachman, & Kirscht, 1972; M. H. Becker, Nathanson, Drachman, & Kirscht, 1977; Bellon, Delgado, De Dios Luna, & Lardelli, 1999; Maiman, Becker, Kirscht, Haefner, & Drachman, 1977; Mirotznik, Ginzler, Zagon, & Baptiste, 1998). In this study the Health Belief Model (HBM) is proposed as a conceptual framework for understanding pediatric patient attendance in Chile. The HBM has been used to explain multiple health behaviors and outcomes including pediatric patient attendance(Aqil, Lippeveld, & Hozumi, 2009; M. H. Becker et al., 1977; Carpenter, 2010; Jones, Smith, & Llewellyn, 2014; Maiman et al., 1977).

Only a few of studies have addressed the validity and reliability of the surveys in characterizing health beliefs. Bates et al., noting the lack of studies addressing the psychometric properties of instruments, examined the reliability and construct validity of a Maternal Health Beliefs Questionnaire in the USA. Their study of mothers of newborn infants in an urban setting found eight domains each with a Cronbach's alpha, the proportion of variance within a scale that is due to the true score, over 0.70. According to DeVellis, scores should ideally be somewhere between 0.70 and 0.90 to demonstrate reliability, so these results suggested adequate internal consistency (Bates, Fitzgerald, & Wolinsky, 1994; DeVellis, 2011).

Several subsequent studies focused on pediatric attendance. In Soliday and Hoeksel's study of post-emergency room care adherence, they adapted the Bates et al. questionnaire to include beliefs pertinent to wider pediatric populations. Factor analysis yielded five factors (four were used in analysis) with reliability coefficients of 0.78 or above suggesting – in addition to the internal construct validity seen in the factor analysis and coherence with the original model – that this questionnaire also displayed adequate reliability(Soliday & Hoeksel, 2000). They subsequently tested a similar questionnaire in the same setting to look at emergency department utilization and found similar factors (Soliday & Hoeksel, 2001). These questionnaires are a useful starting point for studies of pediatric patient attendance. Nonetheless, since they have primarily been tested in high-income English-speaking settings, their contextual appropriateness should be determined before being applied to other settings, such as that of Chile's public health system, where the population is Spanish speaking and most users are low income (Bates, Fitzgerald, & Wolinsky, 1994; Bellon et al., 1999; Gözüm & Aydin, 2004). This study adapts and administers a questionnaire based on the HBM as part of the study of pediatric patient attendance in Chile. Specifically, the study sought to explore underlying health beliefs and assess the reliability and validity of these factors amongst guardians of pediatric patients. The number of study participants who completed questionnaires was powered for psychometric analysis, thus not everyone in the overall sample completed a questionnaire. For those that did complete a questionnaire, their responses were analyzed in the subsequent cross-sectional and longitudinal study.

Methods

Demographic Item Selection

Selection of variables was based on prior studies on appointment attendance, the HBM, and formative evaluations of patient attendance conducted at Hospital Luis Calvo Mackenna (HLCM) (M. Becker et al., 1978; Gurol-Urganci, de Jongh, Vodopivec-Jamsek, Atun, & Car, 2008; Janz & Becker, 1984; Mirotznik et al., 1998; Paredes, 2013). Patient characteristics included gender, age, and type of health insurance (FONASA) as a proxy for their socioeconomic status (A, B, C, D or other where patients, with those categorized with "A" having the lowest socioeconomic status) (Fondo Nacional de Salud, 2014). Guardian characteristics included gender, relationship with the patient, education level, marital status, and employment status. Other guardian factors, including age and insurance status, were initially collected but discontinued due to the high frequency of missing responses. Since patients typically use primary care facilities in their home community, the community where the patient initially enrolled was included as a proxy for distance and for potentially shared characteristics at the community level. These variables were rescaled when appropriate.

Psychometric Scale Item Selection

Initial survey items were selected using prior results from similar settings. The Maternal Health Beliefs Questionnaire developed by Bates et al. built on Becker et al.'s original work with eight distinct domains (Severity, Low Benefit, Low Susceptibility, Moderate Benefit, Health Motivation, High Susceptibility, Barriers, and Cost) emerging from factor

analysis (Bates, Fitzgerald, & Wolinsky, 1994; M. Becker et al., 1978). While this questionnaire formed the basis for several subsequent studies on immunization status and maternal health beliefs, (Bates, Fitzgerald, Dittus, & Wolinsky, 1994; Bates & Wolinsky, 1998; Rhee Kim & Telleen, 2001) these studies focused on caretakers of infants, leaving no suitable alternative measure for guardians of older children. Soliday and Hoeksel tested domains believed to be pertinent to wider pediatric groups and arrived at similar factor structures (Barriers, Benefits, Severity, Motivation, and Susceptibility) (Soliday & Hoeksel, 2000, 2001).

Domains selected from the HBM for use in this study included: the benefits and barriers of attending the scheduled appointment; health motivation; seriousness of disease; and susceptibility to ill health (**Appendix 3.1)**. A four point Likert scale was used for most items with a score range of 1 "Strongly disagree", 2 "Disagree", 3 "Agree", and 4 "Strongly agree." Initially, scales or domains detailed in pertinent studies were assembled and compared for duplication, pertinence, and specificity along with psychometric properties. Duplicate questions were combined, irrelevant items eliminated based on face validity (Morgan, Gliner, & Harmon, 2001), and unclear questions modified for the study purpose. The remaining questions were grouped according to their originally hypothesized domains.

Measure Adaptation

Since the HBM was primarily based on results from English-speaking guardians in the United States, the questionnaires were adapted for the Spanish-speaking Chilean guardian

population. According to Medina-Shepherd and Kleier when translating HBM scales, presenting a native language version that best captures the meaning of the original questionnaire is essential. The researchers suggest that a process focused on adapting meaning, not just translating words, and led by translators with cultural knowledge of the research setting, is key to assuring instrument validity in both the primary and secondary languages (Medina-Shepherd & Kleier, 2010).As such, the HBM questionnaire for this study was developed in English and translated to Spanish by a bilingual and bicultural researcher with prior translation and questionnaire development experience. Another bilingual member of the study team reviewed the translation to check for meaning and accuracy.

After review of the instruments, the finalized scale was pilot tested with a small cohort of guardians from HLCM in order to ensure clarity and identify issues with administration. Respondents completed the questionnaire and provided verbal feedback regarding the questions and survey process. Input from this pilot phase, along with feedback from the study team, shaped the final scale. These steps mirrored those taken in past reliability and validity studies for translated versions of HBM scales(Capik, 2011; Gözüm & Aydin, 2004; Medina-Shepherd & Kleier, 2010; Roden, 2004).

Sample

Several researchers have proposed sample sizes for psychometric surveys. Previous studies suggest that it is ideal to have about 5-10 subjects per item with fewer needed as the sample size surpasses 300 (DeVellis, 2011; Tinsley & Tinsley, 1987). Costello and

Osborne reviewed 303 articles over a two-year period and found that in practice 40% of studies used a ratio of 5 or fewer participants per question while 22.7% fell within this ideal range of 5-10 participants per question, with the remainder employing more per question. These authors noted that smaller samples tended to result in less accurate solutions, erroneous item loading on factors, Heywood cases, and failures to converge (Costello & Osborne, 2011).

Based on this literature, the target sample for the 31 items included in the questionnaire was 300. Open enrollment for the study started in December, 2013 and continued until the target sample size was met. Due to changes in enrollment methods early in the study, half of the questionnaires were administered by phone, with the remainder administered in person by an interviewer (38%) or self-administered (12%). The analysis was limited to respondents with more than 20 (66%) complete responses on their psychometric survey. Data on the patient, guardian, and location characteristics were also used in this study.

Analysis

While it was hypothesized that HBM factors underlie the intention to attend, as well as subsequent attendance, exploratory factor analysis of these items was used to establish underling factors since the study questions, population, and area of interest are sufficiently different from other uses reviewed in the literature (Norman & Streiner, 2003; Streiner & Norman, 2008).

To avoid spurious analysis of unrelated variables, Dziuban and Shirkey proposed that Bartlett's Test for Sphericity and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy be undertaken before attempting factor analysis. Bartlett's Test for Sphericity is a chi-squared test that assesses whether the correlation matrix amongst a group of variables is independent. Rejection of the null hypothesis that these variables are independent ($p<0.05$) suggests data appropriate for analysis.

Next, exploratory factor analysis was performed. Since the outcomes were ordinal, polychoric correlations were used to estimate the correlation matrix, which in turn was used to perform principal component analysis. Setting a cutoff value, identifying the scree point, and parallel analysis, are three common methods used to select the number of factors in exploratory factor analysis (Zwick & Velicer, 1986). The Kaiser or "K1" method proposes retaining all factors with an eigenvalue of 1.0 or above (Kaiser, 1960). The scree method involves eliminating the qualitatively lower eigenvalues by inspecting the eigenvalues plot and visually determining the inflection point of the graph (Cattell, 1966). Parallel analysis simulates completely random responses to your questions and then compares the resulting eigenvalues to the actual eigenvalues (Hayton, Allen, & Scarpello, 2004; Zwick & Velicer, 1986). All three methods were used during the initial exploratory factor analysis to guide model selection.

To improve fit, items were then considered for elimination. While ideally there should be at least 3 items per factor and these items load only on that factor, items with loadings less than 0.4 and "crossloads" or loadings on multiple factors over 0.4 were identified and

deleted to improve factor coherence and clarity (Costello & Osborne, 2011; Guvenc, Akyuz, & A√ßikel, 2011; Leoutsakos, 2011). High levels of uniqueness also helped to prune models. When there is no clear number of factors, multiple factor analysis models using the maximum likelihood (or iterated principal factor if Heywood case is encountered) method can be compared and selected based on the properties of their loadings and items. Higher correlations between items of the same factor than with items outside the factor indicate better discriminant internal construct validity. The strength of the relationship amongst these factors was also examined as it may provide evidence of external construct validity between constructs that may, or may not, be expected to be related.

The reliability of the scale was assessed via Cronbach's alpha. According to DeVellis, Cronbach's alpha is the proportion of variance within a scale that is due to the true score and it is an important measure of one aspect of scale reliability, internal consistency. Scores have a possible range of 0.00-1.00 and should ideally be greater than 0.70 for group comparison and greater than 0.90 for treatment monitoring (Nunnally, Bernstein, & Berge, 1967). Since poor reliability can lower internal consistency, those with low reliability may subsequently be dropped depending on their effect on the scale's overall alpha.

Finally, open-ended in-depth interviews with a subset of the study guardians (N=11) were performed and results were incorporated in the discussion to further contextualize findings.

Results

Study Population

A total of 295 guardians completed the minimum number of questions required to be included in the analysis (**Appendix 3.2**). A slight majority of the patients were male (55.3%) and were under-5 years old (50.7%); most had FONASA Group A (46.6%) (**Appendix 3.3.1**). Most guardians were female (91.9%) and the parent of the child (90.9%), with similar proportions that were married or co-habitating (45.9%) and that were single or widowed (50.3%); many were working full-time (30.8%) or part-time (17.7%) with a significant proportion that were unemployed (37.7%) or homemakers (13.3%) (**Appendix 3.3.2**). Half of the patients came from the community of Penalolen (54.9%), with the largest percentage enrolling at the San Luis clinic (15.3%) (**Appendix 3.3.3**).

Scale Questions

The HBM questions and their score distributions (**Table 3.1)** indicated a relatively low degree of missing responses (range: 0.0% to 4.8%) with an average of just over 290 responses per question. Given the low degree of missing values, imputation was not pursued. More than half of participants marked "Strongly Agree" for the following questions: "B20. Following the doctor's advice will improve the health of my child" (65.0%), "B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot" (52.7%), and "B15. It would be serious for my child to have a chronic illness in the future" (50.7%).

Scoring for the reversed scored questions was inverted so that the answer for a person marking “Strongly Disagree” (1 point) was changed to “Strongly Agree” (4 points) to maintain theoretical coherence with the rest of the domain items. These reversed scoring questions included: “B8. I almost never take the illnesses I get seriously,” “B9. I only think about my health from time to time,” “B16. It will be easy for me to bring the child into the clinic for check-ups,” “B18. It will be easy to travel to my child's appointment,” and “B29. I am satisfied with my child's doctor.” Mean scores for these questions were fairly similar to scores for non-reversed items, although B29 had the lowest mean score overall. This could indicate that participants were consistently marking similar answers throughout the questionnaire, did not understand the question format, or simply were reporting these lower values for these specific questions. With the exception of B29, the other reversed questions did not fall outside of the range of means for the remaining normally scored questions (range: 2.27-3.64).

Table 3.1: Health Belief Model Items by Proposed Domains							
Barriers	**Compl. Disagree**	**Disagree**	**Agree**	**Compl. Agree**	**Mean**	**SD**	**Total**
B1. Paying for my child's treatment will be difficult	5.5%	15.8%	43.6%	35.1%	3.08	0.85	291
B12. Medical appointments are time consuming	1.7%	27.8%	32.0%	38.5%	3.07	0.85	291
B14. Medical care for my child is expensive	8.6%	37.7%	32.9%	20.9%	2.66	0.90	292
B16. It will be easy for me to bring the child into the clinic for check-ups (reversed)	22.0%	41.9%	26.1%	10.0%	2.24	0.91	291
B17. Paying for the child's check-ups will be a problem.	6.9%	23.9%	36.3%	32.9%	2.95	0.92	289
B18. It will be easy to travel to my child's appointment (reversed)	17.8%	50.0%	26.4%	5.8%	2.20	0.80	292
B26. It will be difficult to attend this appointment	14.7%	52.2%	24.2%	8.9%	2.27	0.82	293
B29. I am satisfied with my child's doctor (reversed)	30.0%	59.2%	9.4%	1.4%	1.82	0.65	287
Benefits	**Compl. Disagree**	**Disagree**	**Agree**	**Compl. Agree**	**Mean**	**SD**	**Total**
B5. This follow up appointment will help my child be healthy in the future	1.7%	4.8%	49.5%	43.9%	3.36	0.66	289
B13. Doctors can help you keep your child from getting a short term illness	5.4%	21.4%	45.9%	27.2%	2.95	0.84	294
B20. Following the doctor's advice will improve the health of my child	0.0%	1.0%	34.0%	65.0%	3.64	0.50	294
B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot	0.0%	2.4%	44.9%	52.7%	3.50	0.55	292
B22. Taking my child to the hospital for short-term illnesses can help his or her health a lot	2.4%	13.4%	47.3%	37.0%	3.19	0.75	292
B25. Taking my child to the hospital for preventive care can help his or her health a lot	0.7%	8.9%	49.0%	41.4%	3.31	0.66	292
B27. Doctors can help you keep your child from getting a preventable illness	1.4%	11.0%	59.1%	28.5%	3.15	0.66	291
B28. Doctors can help you keep your child from getting an accident or injury	14.6%	42.0%	29.9%	13.5%	2.42	0.90	288

Table 1: Health Belief Model Items by Proposed Domains (cont'd)							
Health Motivations	**Compl. Disagree**	**Disagree**	**Agree**	**Compl. Agree**	**Mean**	**SD**	**Total**
B7. My health is the most important consideration in my life.	2.1%	15.5%	33.1%	49.3%	3.30	0.80	290
B8. I almost never take the illnesses I get seriously (reversed)	11.3%	28.7%	36.5%	23.5%	2.72	0.95	293
B9. I only think about my health from time to time (reversed)	12.9%	40.0%	27.8%	19.3%	2.54	0.95	295
B19. Whenever I'm ill, no matter how mild the symptoms, I take it seriously	5.8%	23.1%	47.6%	23.5%	2.89	0.83	294
B24. I think about my health a lot	3.8%	29.4%	41.0%	25.9%	2.89	0.83	293
B31. Whenever I get sick it concerns me a lot	3.4%	26.6%	40.3%	29.7%	2.96	0.84	293
Severity	**Compl. Disagree**	**Disagree**	**Agree**	**Compl. Agree**	**Mean**	**SD**	**Total**
B4. It would be serious for my child to have a short-term illness in the future	6.0%	26.3%	41.6%	26.0%	2.88	0.87	281
B11. It would be serious for my child to have a minor accident or injury in the future	2.8%	16.3%	46.7%	34.3%	3.12	0.78	289
B15. It would be serious for my child to have a chronic illness in the future	3.1%	7.6%	38.5%	50.7%	3.37	0.76	288
Susceptibility	**Compl. Disagree**	**Disagree**	**Agree**	**Compl. Agree**	**Mean**	**SD**	**Total**
B2. My child gets sick easily	12.7%	44.0%	22.7%	20.6%	2.51	0.96	291
B3. Most children's health problems can be prevented	2.4%	14.4%	55.8%	27.4%	3.08	0.71	292
B6. My child's chances of getting an injury or having an accident are great	7.9%	30.7%	37.6%	23.8%	2.77	0.90	290
B10. My child's chances of getting short-term illnesses are great	4.8%	30.3%	43.1%	21.7%	2.82	0.83	290
B23. I take most of my child's illnesses to the doctor	1.0%	6.1%	44.0%	48.8%	3.41	0.65	293
B30. My child's chances of getting chronic illnesses are great	5.2%	43.2%	33.8%	17.8%	2.64	0.83	287

Exploratory factor analysis

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy gave a "middling" level of sampling adequacy (KMO=0.764) while Bartlett's Test for Sphericity ($p<0.001$) indicated that there was a non-zero correlation between the items and that factor analysis can be used. Parallel analysis was equivocal as was K1 with nine factors having an eigenvalue of 1.0 or higher so models with two to nine factors were then tested based on results from the scree plot (**Figure 1**).

Figure 3.1: Initial Exploratory Factor Analysis Scree Plot

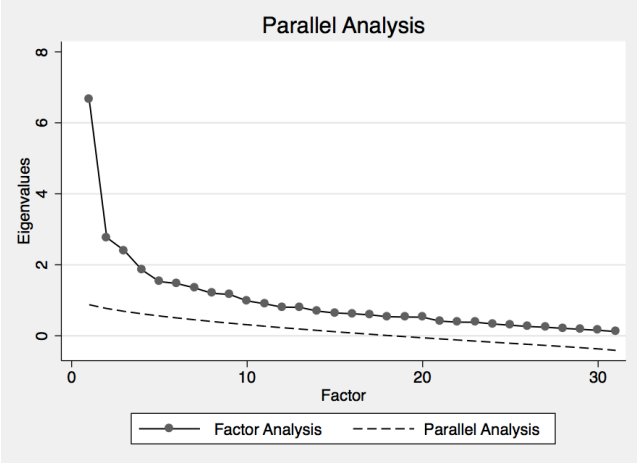
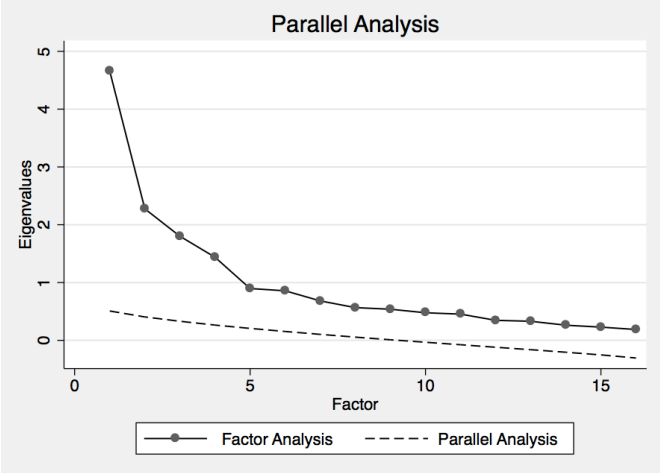


Table 3.2: Eigenvalues and Variance by Rotated Factor

Factor	Eigenvalue	Net Variance
Factor1	4.66	29%
Factor2	2.28	43%
Factor3	1.80	55%
Factor4	1.44	64%
Factor5	0.90	69%
Factor6	0.86	75%
Factor7	0.68	79%
Factor8	0.57	82%
Factor9	0.54	86%
Factor10	0.48	89%
Factor11	0.45	92%
Factor12	0.35	94%
Factor13	0.33	96%
Factor14	0.26	97%
Factor15	0.23	99%
Factor16	0.19	100%

The Heywood case was encountered so the iterated principal factor method was used. In subsequent iterations of the exploratory factor analysis across most of the models with nine or less factors. Items B01, B03, B04, B05, B07, B11, B12, B14, B16, B17, B18, B19, B26 and B29 had high levels of uniqueness and low loadings and were dropped. Both three and four factor models had similar psychometric properties. However, with a scree plot (**Figure 3.2**) showing an inflection point at four and the initial factor loadings (**Table 3.2**) showing only four factors with eigenvalues over 1, (eigenvalues=4.66, 2.28, 1.80 and 1.44) the four factor model was selected.

Figure 3.2: Revised Exploratory Factor Analysis Scree Plot



Cronbach's alpha results were between 0.58-0.74 demonstrating levels of internal consistency that were acceptable and consistent with prior validation studies of parents of pediatric patients (Bates, Fitzgerald, & Wolinsky, 1994; Soliday & Hoeksel, 2000). The Factor Rotation Matrix (**Table 3.3**) revealed a moderate degree of correlation: Factors 1 and 2 were correlated (0.41), as was Factor 3 with Factor 1 (0.27) and Factor 2 (0.27). Factor 1 had the highest average (3.38; SD=0.44) with Factor 3 having the lowest average (2.68; SD=0.62). Factor 1 (0.74) and Factor 4 (0.70) were at or above the desired cutoff for Cronbach's alpha while Factor 2 (0.58) and Factor 3 (0.64) was lower indicating slightly lower levels of internal consistency for those factors.

Table 3.3: Factor Rotation Matrix

	Factor1	Factor2	Factor3	Factor4	Means (SD)	Cronbach's Alpha
Factor1	1.00				3.38 (0.44)	0.74
Factor2	0.41	1.00			2.9 (0.6)	0.58
Factor3	0.27	0.27	1.00		2.68 (0.62)	0.64
Factor4	0.06	0.09	0.01	1.00	2.78 (0.65)	0.70

Factor analysis of the final items suggested acceptable construct validity with most items loading only on one factor at 0.4 or greater. The retained items included none of the items from the hypothesized Barriers or Severity domains but 7 of 8 from Benefits, 4 of 6 from

Health Motivations, and 5 of 6 from Susceptibility. Loadings tended to be relatively strong (**Table 3.4**) across the factors suggesting the presence of discriminant internal construct validity. Question B22 loaded equivalently on Factor 1 and 2. While normally this would be eliminated, it was retained due to lack of model improvement with further reduction in items and conceptual similarity to Factor 1. This choice also ultimately led to a higher alpha level for Factor 1 at the expense of Factor 2 compared to the alternative alpha levels for Factors 1 and 2 where B22 was included in Factor 2 (0.69 and 0.64 respectively, result not presented). B24 loaded just above the cutoff of 0.40 on Factor 2 (0.40) but loaded more strongly on Factor 4 (0.64) so was included there.

Table 3.4: Item Loadings by Rotated Factors (Pattern Matrix)

	Factor1	Factor2	Factor3	Factor4
B20. Following the doctor's advice will improve the health of my child	0.82	-0.19	0.01	0.03
B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot	0.75	0.19	-0.09	0.05
B23. I take most of my child's illnesses to the doctor	0.72	-0.04	0.22	0.03
B27. Doctors can help you keep your child from getting a preventable illness	0.48	0.34	-0.16	-0.10
B22. Taking my child to the hospital for short-term illnesses can help his or her health a lot	0.47	*(0.47)*	-0.02	-0.03
B28. Doctors can help you keep your child from getting an accident or injury	-0.09	0.70	-0.08	0.06
B13. Doctors can help you keep your child from getting a short term illness	0.11	0.62	0.04	-0.04
B25. Taking my child to the hospital for preventive care can help his or her health a lot	0.38	0.40	0.07	-0.07
B10. My child's chances of getting short-term illnesses are great	-0.05	-0.05	0.64	-0.10
B30. My child's chances of getting a chronic illnesses are great	0.14	-0.08	0.64	0.08
B6. My child's chances of getting an injury or having an accident are great	-0.12	0.35	0.57	-0.08
B2. My child gets sick easily	0.09	-0.09	0.49	0.00
B8. I almost never take the illnesses I get seriously (reversed)	0.04	-0.17	-0.06	0.76
B9. I only think about my health from time to time (reversed)	0.01	-0.04	-0.21	0.71
B24. I think about my health a lot	-0.01	*(0.40)*	0.15	0.64
B31. Whenever I get sick it concerns me a lot	0.00	0.39	0.19	0.53

Discussion

The objective of this study was to understand the potential utility of an adapted version of the Health Belief Model to pediatric patient attendance in Chile. Exploratory factor analysis of surveys completed by guardians of pediatric patients revealed fewer factors and items than originally hypothesized but found acceptable levels of reliability and validity.

Factor Structure

The questionnaire included 31 questions and was based on the work of Bates et al. and Soliday and Hoeksel. The questionnaire was hypothesized to tap four to eight factors (Bates, Fitzgerald, & Wolinsky, 1994; Soliday & Hoeksel, 2000, 2001), but in the Chilean context four factors (with 16 items) were observed.

Factor 1 drew 4 questions from the original Benefits scale and 1 from the Susceptibility scale. Given the focus on actions taken around illness, these might have been better characterized as "Care Seeking." In interviews, guardians corroborated this domain noting that appointments could, and did, lead to improvements in their child's health. Factor 2 items also drew from Benefits, primarily focusing on questions related to prevention of illness, so that it was considered "Illness Prevention." The pertinence of this domain for referral appointments is unclear. In subsequent interviews, guardians saw tertiary and primary care as oriented toward curative, not preventive, services although some viewed check-ups, visits that are generally preventive in nature, as important to attend.

Factor 3 drew from the Susceptibility questions retaining most of the original questions and focusing on susceptibility to all types of health problems so the "Susceptibility" name was retained. In interviews, guardians did emphasize the importance of potential negative outcomes but focused less on abstract ideas of general susceptibility to disease, as opposed to specific potential negative outcomes in relation to existing health issues. This is similar to results found by Soliday and Hoeksel where guardians were likely making concrete susceptibility assessments about a group of highly heterogeneous health conditions thereby potentially affecting increasing the heterogeneity of the responses (Soliday & Hoeksel, 2000).

Factor 4 was composed of 4 of the 6 original questions from the Health Motivations domain suggesting these questions likely address a similar underlying construct. Given the remaining questions, however, these might more accurately be described as "Parental Health Concerns" given their focus on how the respondent (guardian) thinks about their own health. Interviews with guardians did not address guardian concerns about their own health directly, although they did suggest that many of their beliefs were applied similarly to both themselves and their child.

Health Beliefs

There was a fairly strong relationship between Care Seeking and Illness Prevention (r=0.41) with both incorporating items from the Benefits scale(Bates, Fitzgerald, & Wolinsky, 1994; Soliday & Hoeksel, 2000). The two factors here perhaps draw out a

distinction between taking action on an existing illness (Care Seeking) as compared to a potential illness (Illness Prevention). Susceptibility is even more abstract than these two factors, which may explain the weak relationship between this and the other more tangible factors. The low correlation between these first 3 areas and Parental Health Concerns (r=0.06, 0.09, and 0.01 respectively), may suggest a dichotomy between thoughts about the guardian's own health and their thoughts about their child's health. Conversely, given the differences in the phrasing, they may reflect a difference in higher-level overall assessment of health thinking as compared to the other scenarios that focus on specific types of health issues.

While several of the hypothesized constructs were retained in this analysis, Barriers and Severity were completely eliminated. Barriers, along with benefits, have previously been suggested as most strongly related to behavior in the HBM although, in meta-analysis of HBM studies, most relationships were still somewhat weak (Carpenter, 2010). As has been suggested in prior studies, some of the questions related to appointment cost may be less relevant since nearly all participants were covered by public health insurance (Bates, Fitzgerald, & Wolinsky, 1994). However, other potential barriers like travel logistics, restrictive employment, and inaccurate appointment information that were mentioned in interviews with guardians may not have been considered with sufficient specificity to elicit accurate responses. For example, since some appointment times and dates are not given at the time of referral, some guardians may have answered differently about certain barriers, like transportation or overall time commitment, had they known their complete appointment details. Further, since most patients were Under-5 and therefore guardians

may have already had few referral appointments before, it is also possible that guardians with more experience attending appointments may view barriers (or benefits) differently.

Severity was not retained, which was unexpected. This could reflect a lack of specificity for the current condition, a fundamental difference in the way guardians perceive disease severity or mismatches between actual and perceived severity. In their original scales developed for mothers of newborns, Bates et al. looked at specific diseases which could explain why severity was retained in their analysis as opposed to this study and in work by Soliday and Hoeksel where questions targeted beliefs about the hypothetical occurrence of a short-term illness, accidents or injuries, or chronic illness (Bates, Fitzgerald, & Wolinsky, 1994; Soliday & Hoeksel, 2000).

Another potential explanation is the contrast between static conceptions of severity in this and other HBM questionnaires and the evolving nature of actual or perceived severity over time. This temporal effect has been described by guardians in interviews and in multiple prior studies of the HBM (Carpenter, 2010). Many guardians emphasized the perceived current and anticipated future health outcomes for their child as driving their pursuit of care. While existing scale items captured potential future outcomes, more specific assessments of current health status (i.e. “My child is currently healthy”) and negative future outcomes (i.e. “My child will be health in the future”) might better tap into underlying perceptions of disease severity without requiring an objective understanding of disease severity per se. A 2007 meta analysis by DiMatteo et al. found that, even when parents assessed disease as severe, there wasn’t always a clear

relationship between this assessment and to adherence with medical treatment (DiMatteo, Haskard, & Williams, 2007). Parental educational background and disease specific knowledge have themselves been associated with health outcomes (DeWalt, Dilling, Rosenthal, & Pignone, 2007) further complicating this relationship.

In light of these potential patient and accuracy issues, perceived severity is likely an important yet difficult to measure determinant of attendance. Framing questions in terms of hypothetical future health may offer insight about stable underlying beliefs but, when applied to general patient populations, may also be obscured by heterogeneous health issues. Since actual and perceived disease severity change over time, the relevance of single measures likely also change over time. Future surveys incorporating data about severity and diagnosis could help contextualize these responses. As assessed in this cross-sectional survey, it may have been of limited accuracy even if it were retained.

Unexplored Domains

Interviews with guardians revealed several areas that could be refined or added in subsequent investigations. Some of these, such as FONASA level or employment, are easily quantified. However, other important assessments like long wait times, availability of household resources, educational or professional constraints, family support, and respect for patient priorities, which were later found in interviews and elsewhere to be important (Lacy, Paulman, Reuter, & Lovejoy, 2004; Markowitz, Volkening, & Laffel, 2014; Roden, 2004), were not specifically assessed.

In interviews, many guardians emphasized paying for private appointments as potential alternative to public visits. Opinions, either in absolute or relative terms, around issues of appropriateness, quality, equity, likelihood of attendance, and willingness to pay for private and public services could reveal differences in perceptions of these different services. Efforts to understand these and other factors that may relate to constraints and value of care may reveal important relationships to utilization.

Limitations

This study had several important limitations. The Heywood case was still encountered, which potentially indicates either the lack of coherent factors (as discussed above) or insufficient sample size. Limitations created by an all-volunteer study staff responsible for covering multiple health centers, combined with low guardian participation, were likely the most important reasons for non-response. However, this study missed the target sample by an average of less than 10 responses per item and other validation studies of these scales have been performed with similar numbers, or less participants, per question (Champion & Scott, 1997; Gözüm & Aydin, 2004). This suggests that sample size is less likely to have contributed overall compared with the aforementioned sample composition caveats.

Trade-offs in terms of participant convenience and ideal administration may have also contributed heterogeneous results. Some participants completed the questionnaire over the phone while others completed it in person. In person administration may allow for easier question asking and development of trust with the data collector. However, since

questionnaires were administered in a private area but still at the health center, participants might also alter their opinions because of concerns their responses will alter their care. Phone calls were more convenient for many participants allowing them the privacy of their own home and completion at a time that was less hectic than clinic hours. Nonetheless, it likely was less personal than in-person data collection. In either case, issues with question phrasing may have impacted scores since, even with the help of trained data collectors, high average scores on some reversed questions may indicate the need for changes in scoring, instructions or administration.

The questionnaires represented a cross sectional view of perspectives on a future appointment. Results from guardian surveys indicated that opinions evolve over time, so certain beliefs could have shifted in the time leading up to the appointment and in relation to other contacts with the health system. Additional factors, like guardian age, insurance status, household size, disease status, urgency, household attendance behaviors and others that might be pertinent in future studies were not incorporated in the analysis due to incomplete or incorrect data.

While the diversity of guardians participating in the trial is a strength of the study in terms of generalizability, it may have reduced the ability to find coherent factors in the factor analysis results. Many prior studies "controlled" variability by studying patient populations that were similar in terms of study center, neighborhood, age, insurance or severity. Most focused on internal appointments instead of appointments between facilities and others looked at appointments only for a specific type or care or disease.

These study groups may be more likely to share underlying beliefs, leading to potentially stronger signals from the factor analysis, though the trade off is that results are less generalizable. Larger, more frequent, or more specific samples might further clarify some results from this study.

Finally, while using terminology specific for the public sector, not all questions were targeted only to referral appointments. Subsequent interviews revealed differences in opinion between appointments at HLCM and referring health centers. However, since these were not a primary objective of the interviews, the impact of potential differences on questionnaire responses is unclear. Greater specificity to the Chilean context, specifically with regard to factors identified by guardians as being important, may have also improved some of the questions.

Conclusions

Health beliefs have been widely linked with patient attendance and with many other related behaviors. Nonetheless, which health beliefs are important and the ultimate impact of these beliefs on attendance and other outcomes remain disputed. Some health beliefs, like opinions about the potential benefits of care, are likely fairly central concepts in healthcare decision-making across contexts but others, like susceptibility to illness, may be more mediated by local factors, such as community or societal values, the healthcare system, and endemic disease. The lack of consistent results across contexts and even across time for certain patient populations reveals the importance of adapting and examining questionnaire properties before applying them to new settings.

This study sought to assess the reliability and validity of a questionnaire based on the HBM in a population of guardians of pediatric patients in Santiago, Chile. It found acceptable reliability and validity for the final four-factor scale (Care Seeking, Illness Prevention, Parental Health Concerns, and Susceptibility) indicating it is sufficiently robust to be used in this context. Looking at the correlation between these scale results and patient attendance in larger patient populations will provide important details on what, if any, relationship these factors have on pediatric patient attendance. These results could provide planners and researchers with a better understanding of why patients do not attend their appointments, and with potential information necessary to develop interventions that improve attendance.

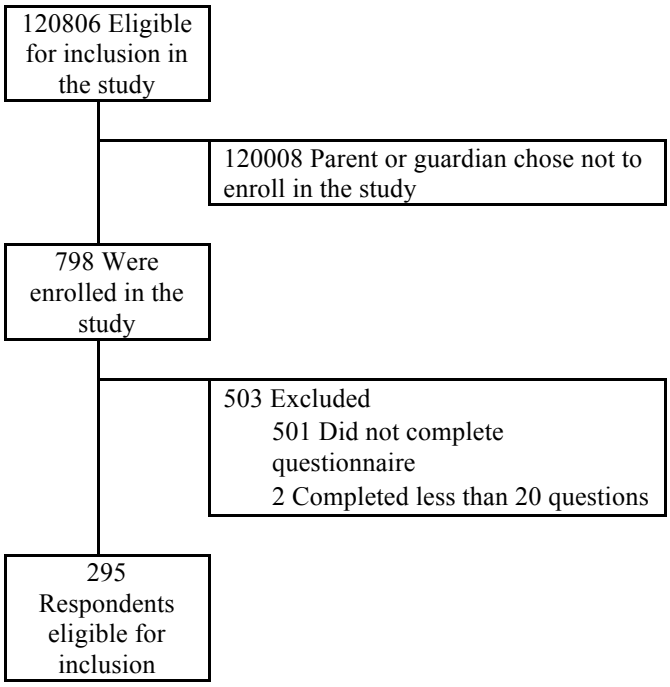
Whether correlated with outcomes or not, the results of this study and of subsequent guardian interviews, illustrate the importance of adapting questionnaires to local context. Psychometric methods are a useful guide for determining which concepts may be grouped together and possibly indicate an underlying construct yet they cannot guide investigators in selecting initial items that address potential underlying constructs. Future studies in Chile, and elsewhere, may consider incorporating more context-specific examples with regard to certain domains like barriers, and consider the potential impact of the local health sector, both in terms of care access and disease patterns, but also in selecting specific questions about disease risk. Similar considerations should also be made with regard to weighing the potential trade-offs between homogenous and heterogeneous study populations.

Appendices

Appendix 3.1: Health Belief Model Original Domains and Items

Barriers
B1. Paying for my child's treatment will be difficult
B12. Medical appointments are time consuming
B14. Medical care for my child is expensive
B16. It will be easy for me to bring the child into the clinic for check-ups (reversed)
B17. Paying for the child's check-ups will be a problem.
B18. It will be easy to travel to my child's appointment (reversed)
B26. It will be difficult to attend this appointment
B29. I am satisfied with my child's doctor (reversed)
Benefits
B5. This follow up appointment will help my child be healthy in the future
B13. Doctors can help you keep your child from getting a short term illness
B20. Following the doctor's advice will improve the health of my child
B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot
B22. Taking my child to the hospital for short-term illnesses can help his or her health a lot
B25. Taking my child to the hospital for preventive care can help his or her health a lot
B27. Doctors can help you keep your child from getting a preventable illness
B28. Doctors can help you keep your child from getting an accident or injury
Health Motivation
B7. My health is the most important consideration in my life.
B8. I almost never take the illnesses I get seriously (reversed)
B9. I only think about my health from time to time (reversed)
B19. Whenever I'm ill, no matter how mild the symptoms, I take it seriously
B24. I think about my health a lot
B31. Whenever I get sick it concerns me a lot
Severity
B4. It would be serious for my child to have a short-term illness in the future
B11. It would be serious for my child to have a minor accident or injury in the future
B15. It would be serious for my child to have a chronic illness in the future
Susceptibility
B2. My child gets sick easily
B3. Most children's health problems can be prevented
B6. My child's chances of getting an injury or having an accident are great
B10. My child's chances of getting short-term illnesses are great
B23. I take most of my child's illnesses to the doctor
B30. My child's chances of getting a chronic illnesses are great

Appendix 3.2: Enrollment and Eligibility



Appendix 3.3: Summary Statistics

Appendix 3.3.1: Patient Summary Statistics		
Gender	**N**	**%**
Male	163	55.3%
Female	132	44.8%
Total	295	100.0%
FONASA	**N**	**%**
Group A	96	46.6%
Group B	40	19.4%
Group C	27	13.1%
Group D	37	18.0%
Other	6	2.9%
Total	206	100.0%
Apt Age (Cat)	**N**	**%**
Under 5	114	50.7%
5 to 9	73	32.4%
10 or older	38	16.9%
Total	225	100.0%

Appendix 3.3.2: Guardian Summary Statistics		
Gender	**N**	**%**
Male	24	8.1%
Female	271	91.9%
Total	295	100.0%
Relationship with Patient	**N**	**%**
Other Guardian	27	9.2%
Parent	268	90.9%
Total	295	100.0%
Highest Level Started	N	%
Preschool or less	1	0.4%
Primary or Secondary	163	69.4%
Technical School or more	71	30.2%
Total	235	100.0%
Marital Status	**N**	**%**
Married or Co-habitating	134	45.9%
Single or Widowed	147	50.3%
Separated or Divorced	11	3.8%
Total	292	100.0%
Occupation	**N**	**%**
Full time	89	30.8%
Part time	51	17.7%
Unemployed	109	37.7%
Homemaker	40	13.8%
Total	289	100.0%

Appendix 3.3.3: Household Summary Statistics		
Community at Enrollment	**N**	**%**
La Reina	19	6.4%
Penalolen	162	54.9%
Providencia	48	16.3%
Macul	34	11.5%
Lo Barnechea	20	6.8%
Nunoa	12	4.1%
Total	295	100.0%
Referring Clinic at Enrollment	**N**	**%**
Ossandon	1	0.4%
Juan Pablo II	13	5.8%
Cardenal Silva Henríquez	12	5.3%
Carol Urzua	16	7.1%
La Faena	31	13.7%
Lo Hermida	16	7.1%
Padre Gerardo Whelan	3	1.3%
San Luis	41	18.1%
El Aguilucho	4	1.8%
Hernan Alessandri	37	16.4%
Dr Felix De Amesti	7	3.1%
Padre Alberto Hurtado	5	2.2%
Santa Julia	12	5.3%
Lo Barnechea	20	8.9%
Rosita Renard	5	2.2%
Salvador Bustos	3	1.3%
Total	226	100.0%

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Chapter 4: Modeling Failure to Attend Over Time: A mixed-effects model of patient attendance at a pediatric urban referral hospital in Santiago, Chile

Study Objectives

Incorporating the psychometric survey developed in the preceding chapter, in this chapter of "Investigating "Interconsultas": A mixed-methods study of pediatric patient attendance in Santiago, Chile", available attendance and appointment information for study enrollees is used to determine the patient, guardian, household, facility, and health beliefs factors related to appointment attendance at Hospital Luis Calvo Mackenna (HLCM). This analysis is intended to examine existing theory on patient attendance and provide planners in similar contexts with an understanding of relevant cross sectional and longitudinal factors that may impact FTA.

Analysis

First, in the cross-sectional analysis, the next available visit after enrollment with attendance data was analyzed. 513 participants had both baseline characteristic and attendance data available and 207 of those completed health belief questionnaires. This data has the advantage of being the most recent and is most likely to be accurate (**Section 2**). Next, with appointment attendance information available for most visits from 2011 onward, the longitudinal analysis included attendance data for any appointment available in the HLCM system (**Section 3**). The longitudinal analysis allowed for updating of visit characteristics only and used cross-sectional survey data for patient and household characteristics.

The chi-squared statistic, a non-parametric test of whether the actual frequency differs from the expected distribution (Norman & Streiner, 2003), was used to compare differences in patient and household characteristics by attendance. For the psychometric scale items, the t-test was used to compare differences in mean scores between those that attended and did not attend their appointment.

In regression models, the logistic command using the patient as the clustering variable (Huber/White robust variance estimator) and robust standard errors was performed for each independent variable in the cross sectional and longitudinal data. In addition to the patient, guardian, and visit type (new vs. repeat) variables hypothesized as associated with attendance, variables that were significant at the $p<0.1$ level were considered for inclusion in the multivariate models. To account for potential changes in health beliefs over time, multivariate models for health beliefs were also adjusted for the time difference between the visit and survey. Since the data was clustered, the Wald test was used instead of the likelihood ratio test to confirm findings from the regression results and additional variables were included in the multivariable model if found to be significant by Wald test. Since most of the covariate patterns were unique, the Hosmer-Lemeshow fit test was used to assess the fit of each multivariate model.

Next, in longitudinal analysis, amongst the enrolled study participants, 6,902 visits from 657 participants were available with at least some information about baseline characteristic and attendance while 3,706 of those visits were with someone who had

completed the health belief questionnaires. Multilevel models using the xtmelogit command were used whenever a single patient could contribute multiple visit data points. While regression analysis can be directly employed to study simple random samples, when the data is nested within groups, such as individual patients (or even communities or clinics), as is the case in this study, multilevel methods may be preferred (Goldstein & McDonald, 1988). According to Diez-Roux this type of modeling accounts for the non-independence of observations within groups, allows for the estimation of group and individual predictors as well as their distinct variations, and acknowledges that the examined groups are drawn from a wider set of existing groups (Diez-Roux, 2000). Since observations were nested within patients, a multilevel mixed effects model was selected. The mixed model included the independent variables as fixed effects and treated each patient as a random effect thereby allowing the impact of these independent variables to be measured while taking into account patterns of attendance that may be unique to each individual. (Hedeker, 2005)

The “Investigating Interconsultas” study also performed follow up in-depth interviews with a subset of the study guardians (N=11). These open-ended interviews explored the opinions, experiences, processes, and values around patient attendance. Results from this qualitative analysis were also presented here as a way to contextualize and triangulate quantitative results.

Results

Section 1: Model Diagnostics

Independent variables were checked for colinearity using the variance inflation factor (VIF). Enrollment clinics are a subset of the enrollment community so they were dropped from the analysis. The remaining variables were included since none had a VIF greater than 5 (**Appendix 4.1)**.

Section 2: Cross Sectional Analysis

There were no statistically significant differences in appointment attendance by patient, guardian, or household characteristic (**Table 4.1**). In the univariate analysis, there was no difference in the odds of attendance by patient gender, age or FONASA Group. Similarly, there were no significant differences in attendance by guardian characteristics including gender, educational attainment, marital status, employment status or community of residence. The adjusted models also revealed no associations between patient and guardian characteristics and attendance when adjusted for these factors and appointment type (new vs. repeat).

Table 4.1: Population Characteristics and Attendance

	Appointment Attendance			Odds of Attendance			
				Unadjusted		Adjusted ¥	
Patient	Total N	%	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender							
Male	283	78.4%	(73.2-83.1)	Reference		Reference	
Female	224	75.9%	(69.7-81.3)	0.87	(0.57 - 1.31)	0.85	(0.55 - 1.30)
FONASA							
Group A	246	76.8%	(71.0-82.0)	Reference		Reference	
Group B	85	74.1%	(63.5-83.0)	0.86	(0.49 - 1.53)	0.82	(0.44 - 1.53)
Group C	74	77.0%	(65.8-86.0)	1.01	(0.55 - 1.88)	0.99	(0.51 - 1.91)
Group D	87	82.8%	(73.2-90.0)	1.45	(0.77 - 2.72)	1.27	(0.67 - 2.42)
Other	21	71.4%	(47.8-88.7)	0.75	(0.28 - 2.04)	0.71	(0.27 - 1.90)
Apt Age (Cat)							
Under 5	234	79.1%	(73.3-84.1)	Reference		Reference	
5 to 9	175	76.6%	(69.6-82.6)	0.87	(0.54 - 1.39)	0.78	(0.48 - 1.28)
10 or older	104	74.0%	(64.5-82.1)	0.76	(0.44 - 1.30)	0.82	(0.46 - 1.44)
				Unadjusted		Adjusted ¥	
Guardian	Total N	%	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender							
Male	40	77.5%	(61.5-89.2)	Reference		Reference	
Female	473	77.2%	(73.1-80.9)	0.98	(0.45 - 2.13)	1.06	(0.47 - 2.39)
Relationship with Patient							
Other Guardian	43	67.4%	(51.5-80.9)	Reference		Reference	
Parent	470	78.1%	(74.1-81.7)	1.72	(0.88 - 3.38)	1.66	(0.83 - 3.31)
Highest Level Started							
Preschool or less	203	79.3%	(73.1-84.7)	Reference		Reference	
Primary or Secondary	227	77.5%	(71.5-82.8)	0.90	(0.57 - 1.43)	0.87	(0.54 - 1.39)
Technical School or more	81	70.4%	(59.2-80.0)	0.62	(0.34 - 1.11)	0.61	(0.33 - 1.12)
Marital Status							
Married or Co-habitating	218	77.1%	(70.9-82.5)	Reference		Reference	
Single or Widowed	267	77.2%	(71.6-82.1)	1.01	(0.66 - 1.54)	0.99	(0.63 - 1.53)
Separated or Divorced	22	72.7%	(49.8-89.3)	0.79	(0.29 - 2.14)	0.84	(0.30 - 2.36)
Occupation							
Full time	170	78.8%	(71.9-84.7)	Reference		Reference	
Part time	91	73.6%	(63.3-82.3)	0.75	(0.41 - 1.36)	0.83	(0.45 - 1.53)
Unemployed	171	77.8%	(70.8-83.8)	0.94	(0.56 - 1.57)	1.01	(0.58 - 1.74)
Home Maker	69	73.9%	(61.9-83.7)	0.76	(0.40 - 1.46)	0.77	(0.38 - 1.54)
Community at Enrollment							
La Reina	46	80.4%	(66.1-90.6)	0.99	(0.45 - 2.18)	0.91	(0.40 - 2.10)
Penalolen	248	80.6%	(75.2-85.4)	Reference		Reference	
Providencia	31	67.7%	(48.6-83.3)	0.50	(0.22 - 1.14)	0.56	(0.23 - 1.34)
Macul	75	77.3%	(66.2-86.2)	0.82	(0.44 - 1.53)	0.84	(0.44 - 1.60)
Lo Barnechea	49	69.4%	(54.6-81.7)	0.54	(0.27 - 1.08)	0.5	(0.25 - 1.01)
Nunoa	64	71.9%	(59.2-82.4)	0.61	(0.33 - 1.15)	0.66	(0.34 - 1.28)

* $p<0.05$; ** $p<0.01$, ^Rounded

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

No differences in attendance were found by appointment type, time, day, month, total number of visits, or provider type in the unadjusted and adjusted analyses (**Table 4.2**).

Table 4.2: Visit Characteristics and Attendance

	Appointment Attendance			Odds of Attendance			
				Unadjusted		Adjusted ¥	
Appointment and Provider	Total N	%	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Type							
Repeat	180	76.1%	(69.2-82.1)	Reference		Reference	
New	333	77.8%	(72.9-82.1)	1.10	(0.71 - 1.69)	1.06	(0.69 - 1.65)
Time							
09:59 or earlier	224	79.0%	(73.1-84.2)	Reference		Reference	
10:00-11:59	164	72.6%	(65.1-79.2)	0.70	(0.44 - 1.12)	0.66	(0.40 - 1.11)
12:00-13:59	51	80.4%	(66.9-90.2)	1.09	(0.51 - 2.34)	1.03	(0.45 - 2.31)
14:00 or later	74	79.7%	(68.8-88.2)	1.04	(0.54 - 2.01)	1.05	(0.53 - 2.07)
Day							
Monday	109	75.2%	(66.0-83.0)	Reference		Reference	
Tuesday	110	79.1%	(70.3-86.3)	1.25	(0.66 - 2.35)	1.38	(0.72 - 2.65)
Wednesday	8	84.3%	(76.0-90.6)	1.76	(0.90 - 3.47)	1.59	(0.79 - 3.18)
Thursday	109	70.6%	(61.2-79.0)	0.79	(0.43 - 1.44)	0.77	(0.42 - 1.44)
Friday	77	76.6%	(65.6-85.5)	1.08	(0.54 - 2.14)	1.05	(0.52 - 2.11)
Month							
January	25	80.0%	(59.3-93.2)	1.12	(0.31 - 4.07)	1.12	(0.30 - 4.24)
February	11	72.7%	(39.0-94.0)	0.75	(0.16 - 3.59)	0.85	(0.18 - 4.04)
March	10	90.0%	(55.5-99.7)	2.52	(0.27 - 23.48)	2.33	(0.23 - 23.98)
April	21	71.4%	(47.8-88.7)	0.70	(0.20 - 2.48)	0.7	(0.19 - 2.57)
May	31	64.5%	(45.4-80.8)	0.51	(0.17 - 1.55)	0.6	(0.19 - 1.92)
June	32	78.1%	(60.0-90.7)	Reference		Reference	
July	58	82.8%	(70.6-91.4)	1.34	(0.46 - 3.96)	1.19	(0.40 - 3.49)
August	63	71.4%	(58.7-82.1)	0.70	(0.26 - 1.91)	0.65	(0.24 - 1.77)
September	59	81.4%	(69.1-90.3)	1.22	(0.42 - 3.54)	1.24	(0.42 - 3.67)
October	63	73.0%	(60.3-83.4)	0.76	(0.28 - 2.07)	0.71	(0.25 - 1.98)
November	86	79.1%	(69.0-87.1)	1.06	(0.39 - 2.84)	0.91	(0.34 - 2.48)
December	54	81.5%	(68.6-90.7)	1.23	(0.42 - 3.64)	1.34	(0.46 - 3.94)
Total Visits							
1 to 5	243	79.4%	(73.8-84.3)	Reference		Reference	
6 to 10	109	76.1%	(67.0-83.8)	0.83	(0.48 - 1.42)	0.83	(0.47 - 1.47)
11 to 20	85	78.8%	(68.6-86.9)	0.96	(0.53 - 1.77)	0.97	(0.52 - 1.81)
21 or more	76	69.7%	(58.1-79.8)	0.60	(0.33 - 1.07)	0.6	(0.32 - 1.11)
Provider Type							
Physician	404	76.2%	(71.8-80.3)	Reference		Reference	
Non-Physician	108	80.6%	(71.8-87.5)	0.77	(0.46 - 1.31)	0.79	(0.46 - 1.34)

* $p<0.05$; ** $p<0.01$, ^Rounded

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

Just under half of all patients completed the health beliefs survey (n=207, 40.4%) using a four-category likert scale with values ranging from "Strongly Disagree" (1) to "Strongly Agree" (4) (**Table 4.3**). No significant difference was found in mean health belief scores when comparing those who did and did not attend their appointments (average score of 1-4); this was also true for the overall mean score for each domain. Similarly, changes in the score for each individual item and overall domains were also not associated with changes in the odds of attendance in both unadjusted and adjusted models.

Table 4.3: Health Beliefs and Attendance

		Attendance by Response			**Odds of Attendance (a)**	
		Mean Score(b)			Unadjusted	Adjusted¥
	Tot N	Attend. No	Attend. Yes	Difference (95%) (c)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
B20. Following the doctor's advice will improve the health of my child	206	3.69	3.60	0.09 (-0.06 - 0.25)	0.69 (0.37 - 1.28)	0.72 (0.37 - 1.39)
B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot	205	3.56	3.47	0.09 (-0.08 - 0.26)	0.74 (0.40 - 1.35)	0.77 (0.41 - 1.44)
B22. Taking my child to the hospital for short-term illnesses can help his or her health a lot	205	3.33	3.19	0.14 (-0.09 - 0.37)	0.76 (0.47 - 1.23)	0.75 (0.47 - 1.20)
B23. I take most of my child's illnesses to the doctor	206	3.56	3.41	0.15 (-0.03 - 0.32)	0.64 (0.37 - 1.11)	0.62 (0.35 - 1.11)
B27. Doctors can help you keep your child from getting a preventable illness	205	3.19	3.15	0.04 (-0.16 - 0.25)	0.91 (0.55 - 1.48)	0.98 (0.59 - 1.62)
Care Seeking Mean score	206	3.47	3.36	0.10 (-0.04 - 0.24)	0.59 (0.28 - 1.22)	0.61 (0.29 - 1.29)
B28. Doctors can help you keep your child from getting an accident or injury	201	2.48	2.45	0.03 (-0.27 - 0.33)	0.96 (0.68 - 1.36)	0.85 (0.59 - 1.23)
B13. Doctors can help you keep your child from getting a short term illness	207	3.06	2.92	0.14 (-0.14 - 0.41)	0.83 (0.57 - 1.22)	0.78 (0.52 - 1.16)
B25. Taking my child to the hospital for preventive care can help his or her health a lot	205	3.33	3.35	-0.02 (-0.24 - 0.20)	1.05 (0.63 - 1.74)	1.06 (0.63 - 1.78)
Illness Prevention Mean score	207	2.96	2.92	0.03 (-0.17 - 0.23)	0.92 (0.55 - 1.56)	0.81 (0.47 - 1.40)

Table 4.3: Health Beliefs and Attendance (con'td)							
B10. My child's chances of getting short-term illnesses are great	203	2.75	2.83	-0.08	(-0.38 - 0.21)	1.13 (0.75 - 1.71)	1.13 (0.73 - 1.74)
B30. My child's chances of getting a chronic illnesses are great	202	2.76	2.64	0.12	(-0.16 - 0.39)	0.85 (0.57 - 1.26)	0.87 (0.58 - 1.30)
B06. My child's chances of getting an injury or having an accident are great	202	2.65	2.83	-0.17	(-0.47 - 0.12)	1.23 (0.87 - 1.75)	1.23 (0.85 - 1.79)
B02. My child gets sick easily	204	2.73	2.53	0.20	(-0.13 - 0.53)	0.81 (0.57 - 1.16)	0.82 (0.56 - 1.19)
Susceptibility Mean score	207	2.71	2.70	0.01	(-0.22 - 0.23)	0.99 (0.56 - 1.75)	1.01 (0.55 - 1.85)
B08. I almost never take the illnesses I get seriously (reversed)	206	2.92	2.75	0.17	(-0.12 - 0.47)	0.82 (0.59 - 1.15)	0.81 (0.58 - 1.14)
B09. I only think about my health from time to time (reversed)	207	2.65	2.56	0.09	(-0.23 - 0.42)	0.90 (0.63 - 1.29)	0.90 (0.62 - 1.30)
B24. I think about my health a lot	206	2.94	2.88	0.06	(-0.21 - 0.33)	0.92 (0.63 - 1.35)	0.85 (0.57 - 1.29)
B31. Whenever I get sick it concerns me a lot	206	3.04	3.00	0.04	(-0.24 - 0.31)	0.94 (0.62 - 1.43)	0.88 (0.57 - 1.37)
Health Concerns Mean score	207	2.89	2.80	0.10	(-0.12 - 0.31)	0.79 (0.48 - 1.31)	0.73 (0.43 - 1.26)

* $p<0.05$; ** $p<0.01$, ^Rounded
¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), visit type (new vs. repeat), and time between survey and appointment.
(a) Increase in odds of attendance by increase in item score.
(b) Score is the mean of responses. Compl. Disagree (1), Disagree (2), Agree (3), Compl. Agree (4)
(c) Confidence interval for difference between the means.

Section 3: Longitudinal Analysis

In longitudinal analysis, no significant differences in attendance were seen by patient gender. However, there were significant differences by patient age and insurance category ($p<0.05$ for both) (**Table 4.4**). For guardian characteristics, there were no significant differences in appointment attendance by gender, relationship with the patient, marital status, or community of residence; significant differences in attendance were observed by education level and occupation ($p<0.01$ for both).

In the logistic regression analysis, those in FONASA Group D were more likely to attend

their appointments than those in Group A in the unadjusted model (OR=1.30; CI: 1.01-1.68). However, in the adjusted model that accounted for patient and guardian characteristics and visit type this difference did not remain significant. Similarly, compared with working full time, working part time (OR=0.75; CI: 0.57-0.98) or being unemployed (OR=0.78 CI: 0.62-0.97) was associated with lower attendance in univariate models, although these differences were not statistically significant in the adjusted analysis. No other guardian characteristics were associated with attendance in either the unadjusted or adjusted regression analyses.

Table 4.4: Population Characteristics and Attendance					
	Appointment Attendance			Odds of Attendance	
Patient	Total N	%	95% CI	Unadjusted Odds Ratio (95% CI)	Adjusted ¥ Odds Ratio (95% CI)
Gender					
Male	3567	77.4%	(76.0-78.8)	Reference	Reference
Female	3335	77.9%	(76.5-79.3)	1.01 (0.84 - 1.21)	1.01 (0.84 - 1.22)
FONASA*					
Group A	2959	76.2%	(74.7-77.8)	Reference	Reference
Group B	1196	78.6%	(76.2-80.9)	1.14 (0.90 - 1.45)	1.09 (0.85 - 1.39)
Group C	1001	81.3%	(78.8-83.7)	1.30 (1.00 - 1.70)	1.24 (0.94 - 1.63)
Group D	1040	78.0%	(75.3-80.5)	1.30 (1.01 - 1.68)*	1.24 (0.94 - 1.62)
Other	673	75.8%	(72.4-79.0)	1.14 (0.70 - 1.87)	1.15 (0.70 - 1.90)
Apt Age (Cat)*					
Under 5	3088	76.7%	(75.2-78.2)	Reference	Reference
5 to 9	2018	78.2%	(76.4-80.0)	1.02 (0.85 - 1.22)	0.97 (0.81 - 1.17)
10 or older	1418	80.0%	(77.9-82.1)	1.02 (0.81 - 1.29)	1.02 (0.81 - 1.29)
Guardian	Total N	%	95% CI	Unadjusted Odds Ratio (95% CI)	Adjusted ¥ Odds Ratio (95% CI)
Gender					
Male	486	79.0%	(75.1-82.5)	Reference	Reference
Female	5955	77.9%	(76.8-78.9)	0.88 (0.62 - 1.24)	0.98 (0.69 - 1.38)
Relationship with Patient					
Other Guardian	537	76.4%	(72.5-79.9)	Reference	Reference
Parent	5904	78.1%	(77.0-79.1)	1.16 (0.85 - 1.58)	1.15 (0.84 - 1.57)
Highest Level Started**					
Preschool or less	2256	76.4%	(74.6-78.2)	Reference	Reference
Primary or Secondary	3080	79.7%	(78.2-81.1)	1.11 (0.91 - 1.36)	1.06 (0.86 - 1.29)
Technical School or more	1090	76.5%	(73.9-79.0)	1.04 (0.80 - 1.36)	0.96 (0.73 - 1.25)
Marital Status					
Married or Co-habitating	2886	78.8%	(77.3-80.3)	Reference	Reference
Single or Widowed	3089	77.0%	(75.5-78.5)	0.92 (0.76 - 1.11)	0.91 (0.75 - 1.10)
Separated or Divorced	395	78.2%	(73.8-82.2)	1.04 (0.68 - 1.60)	1.12 (0.73 - 1.72)
Occupation **					
Full time	2177	79.8%	(78.0-81.5)	Reference	Reference
Part time	973	76.7%	(73.9-79.3)	0.75 (0.57 - 0.98)*	0.78 (0.59 - 1.02)
Unemployed	2815	75.5%	(73.9-77.1)	0.78 (0.62 - 0.97)*	0.82 (0.65 - 1.03)
Home Maker	806	79.3%	(76.3-82.0)	0.93 (0.70 - 1.25)	0.97 (0.71 - 1.32)
Community at Enrollment					
La Reina	806	79.3%	(76.3-82.0)	1.16 (0.85 - 1.58)	1.03 (0.75 - 1.41)
Penalolen	3180	77.9%	(76.4-79.3)	Reference	Reference
Providencia	393	78.6%	(74.2-82.6)	1.30 (0.88 - 1.92)	1.20 (0.81 - 1.77)
Macul	870	80.1%	(77.3-82.7)	1.13 (0.86 - 1.50)	1.12 (0.85 - 1.48)
Lo Barnechea	617	77.5%	(74.0-80.7)	1.11 (0.80 - 1.54)	1.08 (0.78 - 1.50)
Nunoa	708	74.7%	(71.3-77.9)	0.92 (0.68 - 1.23)	0.87 (0.65 - 1.17)

* $p<0.05$; ** $p<0.01$

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

Visit type was strongly associated with attendance where patients were more likely to miss new appointments in both unadjusted (OR=0.85; CI: 0.75 - 0.97) and adjusted (OR=0.86; CI: 0.75 - 0.98) analyses (**Table 4.5**). Appointment time was also associated with attendance in the unadjusted analyses, suggesting that patients were more likely to attend in late morning (OR=1.16; CI: 1.00 - 1.34) or early afternoon (OR=1.34; CI: 1.07 - 1.67) compared with earlier in the morning, although these results were not significant in the adjusted analyses. Appointment day was not associated with attendance, although appointment month was strongly associated with attendance with the highest attendance rates in January and the lowest in December ($p<0.01$). In both unadjusted and adjusted models, patients were significantly less likely to attend appointments in the months of July, August, September, October and December as compared to the reference month of June. The total number of visits was not associated with appointment attendance in unadjusted or adjusted models. Provider type was associated with attendance ($p<0.01$) with those seeing a non-physician less likely to attend than those seeing a physician in both unadjusted (OR=0.83; CI: 0.71 - 0.97) and adjusted models (OR=0.85; CI: 0.73 - 1.00).

Table 4.5: Visit Characteristics and Attendance

	Appointment Attendance			Odds of Attendance			
Appointment and Provider	Total N	%	95% CI	Unadjusted Odds Ratio (95% CI)		Adjusted ¥ Odds Ratio (95% CI)	
Type**							
Repeat	3901	80.1%	(78.8-81.3)	Reference		Reference	
New	3031	74.5%	(72.9-76.1)	0.85	(0.75 - 0.97)*	0.86	(0.75 - 0.98)*
Time**							
09:59 or earlier	2476	74.8%	(73-76.5)	Reference		Reference	
10:00-11:59	2701	79.1%	(77.5-80.6)	1.16	(1.00 - 1.34)*	1.09	(0.93 - 1.29)
12:00-13:59	762	80.4%	(77.4-83.2)	1.34	(1.07 - 1.67)*	1.24	(0.98 - 1.56)
14:00 or later	993	78.8%	(76.1-81.3)	1.17	(0.95 - 1.43)	1.10	(0.89 - 1.36)
Day							
Monday	1613	76.6%	(74.4-78.6)	Reference		Reference	
Tuesday	1693	78.4%	(76.3-80.3)	1.13	(0.94 - 1.35)	1.11	(0.92 - 1.33)
Wednesday	1177	77.9%	(75.4-80.3)	1.07	(0.87 - 1.30)	1.08	(0.88 - 1.32)
Thursday	1396	77.8%	(75.5-79.9)	1.15	(0.95 - 1.39)	1.15	(0.95 - 1.39)
Friday	1052	77.6%	(74.9-80.1)	1.15	(0.94 - 1.42)	1.16	(0.94 - 1.43)
Month**							
January	419	81.9%	(77.8-85.4)	1.04	(0.73 - 1.47)	1.01	(0.71 - 1.44)
February	279	75.3%	(69.8-80.2)	0.70	(0.48 - 1.01)	0.75	(0.51 - 1.10)
March	544	81.1%	(77.5-84.3)	1.01	(0.73 - 1.39)	1.02	(0.73 - 1.41)
April	588	79.8%	(76.3-82.9)	0.92	(0.68 - 1.25)	0.91	(0.67 - 1.25)
May	578	79.6%	(76.1-82.8)	0.97	(0.71 - 1.32)	1.00	(0.73 - 1.36)
June	628	79.6%	(76.3-82.7)	Reference		Reference	
July	684	76.0%	(72.6-79.2)	0.72	(0.54 - 0.96)*	0.73	(0.54 - 0.98)*
August	637	75.8%	(72.3-79.1)	0.71	(0.53 - 0.95)*	0.69	(0.52 - 0.93)*
September	591	76.6%	(73-80)	0.72	(0.54 - 0.98)*	0.73	(0.54 - 0.99)*
October	748	73.9%	(70.6-77)	0.64	(0.48 - 0.84)**	0.64	(0.49 - 0.86)**
November	712	79.8%	(76.6-82.7)	0.88	(0.66 - 1.18)	0.88	(0.65 - 1.18)
December	524	72.9%	(68.9-76.7)	0.62	(0.46 - 0.84)**	0.60	(0.44 - 0.82)**
Total Visits							
1 to 5	950	75.7%	(72.8-78.4)	Reference		Reference	
6 to 10	1048	77.5%	(74.8-80)	1.10	(0.85 - 1.41)	1.10	(0.84 - 1.43)
11 to 20	1430	76.8%	(74.5-78.9)	1.08	(0.84 - 1.39)	1.05	(0.81 - 1.37)
21 or more	3013	79.4%	(77.9-80.8)	1.20	(0.93 - 1.53)	1.10	(0.85 - 1.42)
Provider Type**							
Physician	1788	81.2%	(79.3-82.9)	Reference		Reference	
Non-Physician	5137	76.4%	(75.2-77.5)	0.83	(0.71 - 0.97)*	0.85	(0.73 - 1.00)*

* $p<0.05$; ** $p<0.01$

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

Applying the guardian health beliefs from the cross-sectional survey to each patient for all respective visits, significant differences in selected health scores were found among guardians of patients that did and did not attend appointments (**Table 4.6**). For the Illness

Prevention Domain, guardians of those who did not attend tended to have a lower level of agreement (mean score from 1 to 4) on the injury prevention (B28, Diff=-0.09;CI:-0.17 - -0.01) although this relationship was not significant in the regression models. Differences were found for use of hospital services for preventative care (B25, Diff=-0.11;CI: -0.17 - -0.04), where higher scores were associated with increased odds of attendance in both unadjusted (OR=1.35;CI: 1.11 - 1.64) and adjusted (OR=1.28; CI: 1.05-1.56) models. The Illness Prevention Domain mean score was significantly associated with attendance both in difference between score by attendance (Diff=-0.07;-0.12 - -0.01) and in the unadjusted analysis (OR=1.24;CI: 1.00 - 1.53) but not the adjusted analysis. In the Susceptibility Domain, those who did not attend were more likely to believe their child had a high risk of a short term illness as shown by higher average level of agreement (B10,Diff=-0.11;-0.19 - -0.03); in unadjusted and adjusted analysis higher scores for short term illness risk were associated with increased attendance (unadjusted OR=1.18;CI:1.01-1.38; adjusted OR=1.17;CI: 1.00 - 1.36) although no difference was found for the Susceptibility Domain score overall. Finally, those with missed visits were less likely to think about their health a lot (B24, Diff=-0.08;CI:-0.16 - -0.00) or feel concerned when they were sick (B31,Diff=-0.10; CI: -0.17 - -0.02) compared to those that attended visits; this did not remain significant in the regression analysis nor for all other Health Concerns domain analyses.

Table 4.6: Health Beliefs and Attendance						
		Attendance by Response			Odds of Attendance (a)	
	Tot. N	Mean Score (b) Attend No	Yes	Difference (95%) (c)	Unadjusted Odds Ratio (95% CI)	Adjusted ¥ Odds Ratio (95% CI)
B20. Following the doctor's advice will improve the health of my child	3068	3.67	3.71	-0.04 (-0.08 - 0.00)	1.22 (0.94 - 1.58)	1.21 (0.93 - 1.57)
B21. Taking my child to the hospital for accidents or injuries can help his or her health a lot	3065	3.54	3.55	-0.01 (-0.06 - 0.04)	1.09 (0.85 - 1.39)	1.03 (0.80 - 1.32)
B22. Taking my child to the hospital for short-term illnesses can help his or her health a lot	3065	3.16	3.17	-0.01 (-0.09 - 0.07)	1.06 (0.89 - 1.26)	1.03 (0.87 - 1.23)
B23. I take most of my child's illnesses to the doctor	3067	3.54	3.52	0.02 (-0.03 - 0.07)	0.96 (0.77 - 1.20)	0.93 (0.74 - 1.17)
B27. Doctors can help you keep your child from getting a preventable illness	3065	3.21	3.19	0.02 (-0.04 - 0.07)	0.98 (0.81 - 1.20)	0.94 (0.77 - 1.15)
Care Seeking Mean score	3068	3.42	3.43	-0.00 (-0.04 - 0.03)	1.10 (0.81 - 1.49)	1.03 (0.76 - 1.39)
B28. Doctors can help you keep your child from getting an accident or injury	2991	2.26	2.35	-0.09 (-0.17 - -0.01)*	1.10 (0.95 - 1.28)	1.07 (0.92 - 1.25)
B13. Doctors can help you keep your child from getting a short term illness	3076	2.92	2.93	-0.01 (-0.09 - 0.06)	1.03 (0.88 - 1.20)	0.96 (0.82 - 1.12)
B25. Taking my child to the hospital for preventive care can help his or her health a lot	3065	3.24	3.35	-0.11 (-0.17 - -0.04)**	1.35 (1.11 - 1.64)**	1.28 (1.05 - 1.56)*
Illness Prevention Mean score	3076	2.82	2.89	-0.07 (-0.12 - -0.01)*	1.24 (1.00 - 1.53)*	1.14 (0.91 - 1.43)
B10. My child's chances of getting short-term illnesses are great	3007	2.77	2.88	-0.11 (-0.19 - -0.03)**	1.18 (1.01 - 1.38)*	1.16 (1.00 - 1.36)
B30. My child's chances of getting a chronic illnesses are great	3027	2.75	2.73	0.03 (-0.05 - 0.10)	0.99 (0.84 - 1.16)	0.99 (0.85 - 1.16)
B06. My child's chances of getting an injury or having an accident are great	2978	2.74	2.81	-0.06 (-0.15 - 0.02)	1.14 (0.98 - 1.32)	1.1 (0.95 - 1.27)
B02. My child gets sick easily	3033	2.74	2.74	0.00 (-0.09 - 0.09)	1.02 (0.89 - 1.16)	1.01 (0.88 - 1.16)
Susceptibility Mean score	3076	2.75	2.80	-0.04 (-0.10 - 0.02)	1.16 (0.95 - 1.42)	1.13 (0.92 - 1.40)

Table 4.6: Health Beliefs and Attendance (con'td)						
		Attendance by Response			Odds of Attendance (a)	
	Tot. N	Mean Score (b) Attend		Difference (95%) (c)	Unadjusted Odds Ratio (95% CI)	Adjusted ¥ Odds Ratio (95% CI)
B08. I almost never take the illnesses I get seriously (reversed)	3073	2.83	2.79	0.04 (-0.04 - 0.12)	0.96 (0.83 - 1.11)	0.93 (0.81 - 1.07)
B09. I only think about my health from time to time (reversed)	3076	2.49	2.48	0.01 (-0.07 - 0.10)	0.98 (0.85 - 1.12)	0.97 (0.84 - 1.11)
B24. I think about my health a lot	3067	2.76	2.84	-0.08 (-0.16 - -0.00)*	1.10 (0.95 - 1.28)	1.09 (0.93 - 1.27)
B31. Whenever I get sick it concerns me a lot	3067	3.00	3.10	-0.09 (-0.17 - -0.02)*	1.12 (0.95 - 1.31)	1.10 (0.93 - 1.29)
Health Concerns Mean score	3076	2.77	2.80	-0.03 (-0.09 - 0.03)	1.05 (0.86 - 1.29)	1.01 (0.83 - 1.24)

* $p<0.05$; ** $p<0.01$, ^Rounded
¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), visit type (new vs. repeat) and time between survey and appointment.
(a) Increase in odds of attendance by increase in item score.
(b) Score is the mean of responses. Compl. Disagree (1), Disagree (2), Agree (3), Compl. Agree (4)
(c) Confidence interval for difference between the means.

Discussion

The objective of this study was to understand what patient, guardian, appointment, and facility or provider variables are related to attendance. While no baseline characteristics or health beliefs were related to attendance in the cross sectional data, some of these factors were related to attendance when looking across all visits.

Patient Characteristics

Patient FONASA category, which is a proxy for socioeconomic status (A is the lowest and D the highest) was correlated with attendance only in the longitudinal analysis. This is similar to results from other studies that have suggested an association between insurance and/or socioeconomic status and attendance (Canizares & Penneys, 2002; Iben, Kanellis, & Warren, 2000; Majeroni, Cowan, Osborne, & Graham, 1996; Weingarten,

Meyer, & Schneid, 1997; Yoon, Davis, Van Cleave, Maheshwari, & Cabana, 2005). Children in the highest FONASA category had increased attendance in the unadjusted model. However, this difference did not remain significant in the adjusted model. Age was associated with attendance in the longitudinal analysis, where older children had higher attendance rates, however, age was not a significant predictor of attendance in adjusted or unadjusted regression models. As has been found in prior studies, age may have been inconsistently associated with attendance due to its relationship with different reasons for referral across age groups or changes in patient involvement in care although these associations were not directly assessed here(Kalb et al., 2012; Markowitz, Volkening, & Laffel, 2014; Samuels et al., 2015; Shaffer et al., 2016).

Guardian Characteristics

Most participants in the survey were the patient's mother, so it is perhaps not surprising that few inferences can be made about the impact of gender or relationship with the patient and attendance. Significant differences in attendance rates by guardian education level were observed in the longitudinal analysis. However, guardian education level was not associated with attendance in regression models. Challenges related to accurate measurement of guardian educational level could have contributed to non-significant findings where there was a lack of specificity in the study instruments for primary and secondary schooling. That differences were not detected even for those with drastically different levels of education could also be explained by those with higher levels of education having the option of accessing care elsewhere or resolving health issues in different ways, although there is no evidence in this analysis that could definitively

support either theory. It is also possible that household head educational attainment, or highest educational attainment of any primary guardian, would be better measures than educational attainment of the guardian presenting at the clinic.

Guardian occupation similarly had a complex relationship with attendance with initial results suggesting it was related to attendance. Nonetheless, adjusted models reduced the significance of this result. That full-time employment was associated with higher attendance refutes the idea that, if appointments are difficult to attend due to taking time off of work, (Smith, Highstein, Jaffe, Fisher Jr, & Strunk, 2002) parents who are unemployed or working part time may attend more appointments instead of less. Accordingly, the relationship between employment and attendance may be more complicated and evolving for many guardians than is captured in this analysis. Measuring the employment status of all adults in the household may be required in a future study to fully understand the relationship with attendance.

Visit Characteristics

New visits were less frequently attended than repeat visits in the longitudinal analysis. While perhaps an expected result, the reasons a new visit might be less attended, as compared to a repeat, are not clear, particularly given that these relationships are potentially impacted even by other variables not included in the models, such as wait time and severity, as well as things like health beliefs and provider type, which were examined in the models although without adjusting for appointment types(King, David, Jones, & O'Brien, 1995; Pesata, Pallija, & Webb, 1999; Ross et al., 1995). Prior studies

support the notion that making time to go to appointments is an important factor in attendance. Contrary to other longitudinal results from attendance at a tertiary care center in Maryland, USA, in this study appointments in the middle of the workday were more frequently attended than those early in the morning. This relationship suggests that perhaps factors unique to the mornings, like school requirements or other family or household responsibilities, could result in morning appointments being more likely to be missed. Transportation issues and distance from facility have previously been cited as being related to attendance (Campbell, Chez, Queen, Barcelo, & Patron, 2000; Collins, Santamaria, & Clayton, 2003; Kalb et al., 2012; Mohamed & Al-Doghaither, 2002; Paul & Hanna, 1997; Pesata et al., 1999; Shaffer et al., 2016). Nonetheless, using community as a proxy for distance, community was not found to be significant. The Lo Barnechea clinic (also the name of its encompassing community), for example, is located nearly 15km from HLCM whereas the two clinics in Providencia are 0.5 and 3.5km from HLCM. An alternate explanation for the lack of effect could be other underlying clinic, community or transportation dynamics that were correlated with attendance in an opposite direction.

In Chile, students are typically on summer break from December to March with a short winter break in mid-July (Ministerio de Educación, 2015). Results from this study show that December was the month with the highest proportion of missed appointments, though many other months during school also had high levels of non-attendance. Further analysis of seasonal changes in referral reasons could further clarify this relationship. Finally, as was supported by other studies, visits with physicians were more frequently

attended than those with other types of providers (Kalb et al., 2012; Markowitz et al., 2014). This could also reflect opinions of the provider yet is also likely to be heavily influenced by an interaction between the underlying disease that necessitated a referral to a physician and guardian health beliefs about the disease process and by the potential for improved health through the follow up appointment.

Health Beliefs

Health Beliefs have been widely hypothesized but inconsistently linked with appointment attendance (Becker, Drachman, & Kirscht, 1974; Becker, Maiman, Kirscht, Haefner, & Drachman, 1977; Becker, Nathanson, Drachman, & Kirscht, 1977; DiMatteo, Haskard, & Williams, 2007; Michel et al., 2011; Sharps, El-Mohandes, El-Khorazaty, Kiely, & Walker, 2003; Soliday & Hoeksel, 2000). In this setting, these relationships were inconsistent, with the exception of beliefs related to susceptibility to short term illness and preventive health, where higher agreement on either question was associated with increased attendance. While it might be expected that parents would go to their appointments because they believe these might impact their child's health, measures in the Care Seeking Domain, which focused on whether care utilization will result in better health, and the Health Concerns Domain, which focused on parental concern for their own health, were not related to attendance in meaningful ways.

Perceptions of susceptibility to disease may have played a weak role in attendance, where this single measure of higher perceived risk of a child becoming ill was related to higher attendance in all visits. In a study of post-ED care in Washington, USA Soliday and

Hoeksel found that while barriers, severity, and susceptibility had significant but sometimes counter-intuitive relationships to post-discharge adherence, none predicted follow up (Soliday & Hoeksel, 2000). Prior studies have indicated that susceptibility was correlated with visits for prevention not treatment (Janz & Becker, 1984), with another review finding other HBM variables also shared this association (Jones, Smith, & Llewellyn, 2014). However, results from the follow-up interviews that were part of the qualitative arm of the here-presented overarching study indicated that guardians understood that referral appointments to HLCM represent an escalation of care beyond the preventive and basic health services typically offered at primary health facilities, so this result in this setting is unexpected. It is possible that these beliefs could have led to initial decisions to seek care at the consultorios and obtain a subsequent referral but this study was not designed to detect these initial attendance decisions.

Multiple unadjusted regression models were initially significant. Nonetheless, when adjusted for patient and guardian characteristics, these no longer were correlated with attendance. Similarly, in a Swiss study of adult survivors of childhood cancer, multiple health beliefs were initially found to be related to attendance, although when adjusted in their models for disease characteristics, like treatment course or outcomes, this impact disappeared (Michel et al., 2011). Although data on diagnosis and severity were not available in this study, the adjusted models here also suggested some aspects of the opinion scores might have been attributable to differences in other variables. For example, differences in education status have been linked with differences in care utilization even when adjusted for disease knowledge and socioeconomic factors

(DeWalt, Dilling, Rosenthal, & Pignone, 2007). Here, higher educational status was associated with lower attendance although this could also mean those with more education may be wealthier or have a higher degree of medical knowledge, which could lead to either better home management or access to private care; outcomes which would potentially lead to not attending a follow up appointment. Communities themselves could also have contributed. Interviews with staff revealed differences in the referral process by community, which could have led to differences in who and which diseases are referred. Other differences likely exist across other covariates.

These results suggest that while some health beliefs may have a relationship with current and future attendance, these beliefs are only a part of a larger set of fluid factors and constraints that influence actual attendance.

Implications for practice

Understanding factors associated with patient attendance can help health systems actors to inform practice and improve attendance rates. With HLCM's high patient volume,[4] the results from this study have important implications for understanding pediatric patient attendance, monitoring the scope of the problem, and approaching future interventions around the Chilean health system.

Attendance data, like that collected as part of this study, has classically been used by HLCM and other facilities to alter the allotment of appointments according to likelihood

[4] Approximately 284 visits per day; 1,420 per week; 5,680 per month

of attendance. However, data from the cross-sectional analysis (approximately two days of visits at HLCM) and the observational data (equivalent to thirty days of visits) suggested that factors found to be significant in the long term may not have a clear bearing on day-to-day attendance.

Over-booking or block scheduling are common approaches where facilities or systems seek to maximize the utilization of clinical resources by decreasing physician down time. The results from this study, however, identify a key weakness in this strategy: aside from some visit parameters, most variables were not coherently related to attendance outcomes. In developing models for estimating attendance in heterogeneous populations, Zeng et al. noted that even if these strategies increase the number of patients seen, they may result in negative outcomes: longer-wait times, overbooked clinicians, and unhappy patients reduce long term productivity and satisfaction (Hasvold & Wootton, 2011; Lacy, Paulman, Reuter, & Lovejoy, 2004; Zeng, Turkcan, Lin, & Lawley, 2010). Individual in-depth interviews, which were carried out with a sub-set of guardians from this setting as part of the overarching study, supported these results. Several guardians specifically cited their experiences with block scheduling and long wait times once at the hospital as factoring into their attendance decision to attend. Given the potential harm these strategies could be having on attendance, they should be discouraged.

As a whole, this analysis and subsequent qualitative interviews, indicated that attendance decisions are more complex than initially anticipated. Scarce family resources, health status, and contextual constraints were identified as not only factoring heavily into

decision-making but also as changing over time. Given the often static and incomplete nature of the data analyzed in this study, improving existing monitoring systems could help to identify potential causes for missed attendance and inform efforts to improve patient attendance.

The Chilean health system, and specifically HLCM, could improve the quality of existing data collection approaches. Basic information used to schedule appointments, like referring community and urgency, are frequently missing as are data generated at the time of visit, such as time on wait list or diagnosis. These records are not added to the HLCM database until an outcome occurs, like disease management through an appointment, or until their referral is removed from the system due to two missed appointments at HLCM. Even once added, they are incomplete for all relevant attended appointments and do not provide information about patients who only have missed one appointment. Improving completeness of data by linking consultorio records with HLCM data could help to minimize this problem.

Developing partnerships with public sector affiliates, such as with nearby adult referral facility Hospital del Salvador, could also increase the amount of data available, particularly about guardians or households, without needing to develop independent collection systems. The Performance of Routine Information System Management (PRISM) framework is an approach to guiding information system goals, implementation, and assessment that has been applied to several potentially similar public health systems across Latin America and, as such, could be relevant to those at HLCM as

they refine their internal data collection processes (Aqil, Lippeveld, & Hozumi, 2009; Plaza, Giusti, Palacio-Mejia, Torres, & Reyes, 2010).

Limitations

This study had several important limitations. First, either a small sample size or the Hawthorn Effect may have played a role in artificially increasing attendance for the next visit. This could have explained, for example, the difference between the non-significant difference in attendance for new vs. repeat visits in the cross sectional analysis as compared to the significant difference that was seen in the all visit data for these two types of visits. Regardless, this study was observational, so the final sample size reflected available data instead of sample sizes powered to detect specific differences by specific characteristics, health beliefs, or other factors.

In addition to small study participant numbers, the in-depth interviews and prior literature suggested that multiple areas that are potentially important for patient attendance were not analyzed in this study. These included data on household characteristics and occupants, quality of care, and attendance over time. Some existing variables, like education, could be broken down into more useful categorizations while age could potentially be analyzed as continuous or in different categories. Information on health status, wait time between referral and appointment, referring clinic (aside from initial enrollment), urgency, and parent attendance were often incomplete in the system. Thus, these were not included in the analysis while others variables, such as appointments for a procedure versus medical care, were not collected.

For the multi-level modeling, unlike other modeling techniques, there is not an agreed upon method for checking model fit. Therefore, discretion is needed to appropriately select and interpret model parameters. In this study, several other multi-level models were considered with the goal of exploring the complexity of the different domains. Models using patient and community as well as patient and clinic were analyzed although the results were not presented because the additional variables did not suggest any differences in variable significance or add to the understanding of the study objective but did increase model complexity. Further, this analysis adjusted for multiple characteristics but did not look for differences within those characteristics and did not always have adequate information on how they changed over time.

Since updated clinic information was sometimes incomplete in the system, the enrollment community and clinic were used during the course of the study. It is possible, however, that some patients may have subsequently moved. The impact of moves on attendance estimates is unknown but likely to be small since moving was likely a relatively infrequent event over the study period. As part of this study, health beliefs were similarly collected at one point and for only the number of participants needed to perform the initial reliability and validity studies. These beliefs likely change over time, so inferences drawn about their overall prospective and retrospective application for less than half of the overall enrolled participants, even though they were adjusted for time, should be interpreted with considerable caution.

Future multi-level models, particularly with larger samples and more comprehensive data sets, could usefully explore difference within or between strata of FONASA, departments, clinics, severity levels, age groups and other factors, as well as focus specifically on how, if at all, these factors relate to future attendance.

This study used data drawn from those already enrolled in the Investigating Interconsultas study. It is unknown how representative these participants or their visits are of the overall HLCM population. Specifically, it is important to note that participants who agree to participate in a study may be more likely to have certain beliefs about health or the health system, have certain educational or professional experiences that motivated them participate, or may possess other characteristics that may make them not only more or less likely to attend their appointments but different from HLCM's larger population.

Finally, this study only examined behavior in the public sector and only appointment attendance at HLCM. And such, its implications are not meant to encompass other sectors.

Conclusions

Many facilities, especially public hospitals like HLCM, face pressure from the health system to see more patients with existing resources and from the public to deliver faster, more responsive care. In HLCM, like other facilities, the number of missed appointments is often close to the number of patients waiting for appointments making these missed visits an attractive target for improving efficiency.

This study is an important contribution toward understanding the factors associated with pediatric patient attendance at HLCM and other public, pediatric hospitals in similar settings. The study did not identify any patient or guardian characteristics that were associated with pediatric attendance. However, certain appointment characteristics like appointment type, month, and provider and specific items from the guardian health beliefs questionnaire about susceptibility and illness prevention were associated with attendance across visits.

These largely null results present an important problem for health systems. Many of the variables analyzed as part of this study were found to be associated with attendance in other studies but not here. While this could mean that the variables collected or the levels analyzed were insufficiently precise or targeted to reveal actual patterns in attendance, its important to also note that this study collected more variables and more types of data than are available through the existing electronic medical record. Accordingly, future analyses conducted at population level by the health system may be similarly or more constrained. Even for variables found to be significant, these relationships may be difficult to translate to policy at the facility or department level where the scheduling processes occur. A result that's significant in aggregate may equate to fractions of a missed appointment per day or appointment block. Even larger effect sizes do not fully account for the large absolute fraction of visits that are missed. Improvements in data collection may help HLCM and the health system to better understand patient attendance but a certain percentage of missed visits will always remain unpredictable.

A final challenge with assessing determinants of attendance is deciding how, if at all, to use them. Results from interventions tested in small, short-term, ideal settings may not always correlate with desired resource utilization and system responsiveness goals when used in large, heterogeneous, evolving populations and health systems. The utility of analyzing attendance data may ultimately be determined by how usefully they inform practice.

Appendices

Appendix 4.1: Variance Inflation Factor			
Category	**Variable**	**Cross Sectional**	**Longitudinal**
Patient	Gender	1.02	1.08
	FONASA	1.13	1.13
	Age at Appointment	1.05	1.12
Guardian	Gender	1.09	1.10
	Relationship with Patient	1.06	1.04
	Education	1.07	1.09
	Marital Status	1.06	1.04
	Employment	1.16	1.19
Household	Community	1.05	1.04
Appointment	Type	1.13	1.10
	Time	1.20	1.11
	Day	1.03	1.01
	Month	1.06	1.01
Provider	Provider type	1.08	1.04

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Chapter 5. Health Call: A randomized controlled trial of interactive automated reminder calls to reduce failure to attend rates at an urban referral hospital in Chile

Study Objectives

Interactive voice response (IVR) systems, have been hypothesized to decrease patient Failure to Attend (FTA) rates with impacts ranging from no effect to significant double digit decreases in FTA rates(Bender et al., 2010; Corkrey & Parkinson, 2002; Crawford et al., 2005; David et al., 2012; Hasvold & Wootton, 2011; Stacy, Schwartz, Ershoff, & Shreve, 2009; Tucker, Roth, Huang, Crawford, & Simpson, 2012). This study will evaluate Health Call, an IVR system, and provide context-relevant evidence for whether it is effective in reducing the number of missed appointments at Hospital Luis Calvo Mackenna (HLCM).

Methods

Participants were enrolled at the 16 basic health centers or "consultorios" in study communities according to the study protocol. One to two weeks before their appointment date, participants were randomized into either the intervention or control arm. As participants were added to clinic lists they were assigned to sequential pre-randomized blocks of ten in the Health Call database (five Intervention and five Control) for each facility.

The Health Call system delivered a predetermined greeting, a security screen asking for the respondent to confirm they are a guardian, as well as confirm the patient birth month

and year, before delivering a reminder about the date and time of the appointment. Participants in the control arm received standard of care, which at the time of study implementation was no reminder call**.** Once randomized, several possible reminder outcomes were possible. First, if the number called was incorrect, the system would be unable to generate a call. Second, if the number was correct, the participant could be called, at which point they might not choose to pick up. Third, participants could receive the call, confirm their identity by completing the security screening, and receive the reminder. This third option was the only case in which they would receive the actual appointment reminder.

Analysis

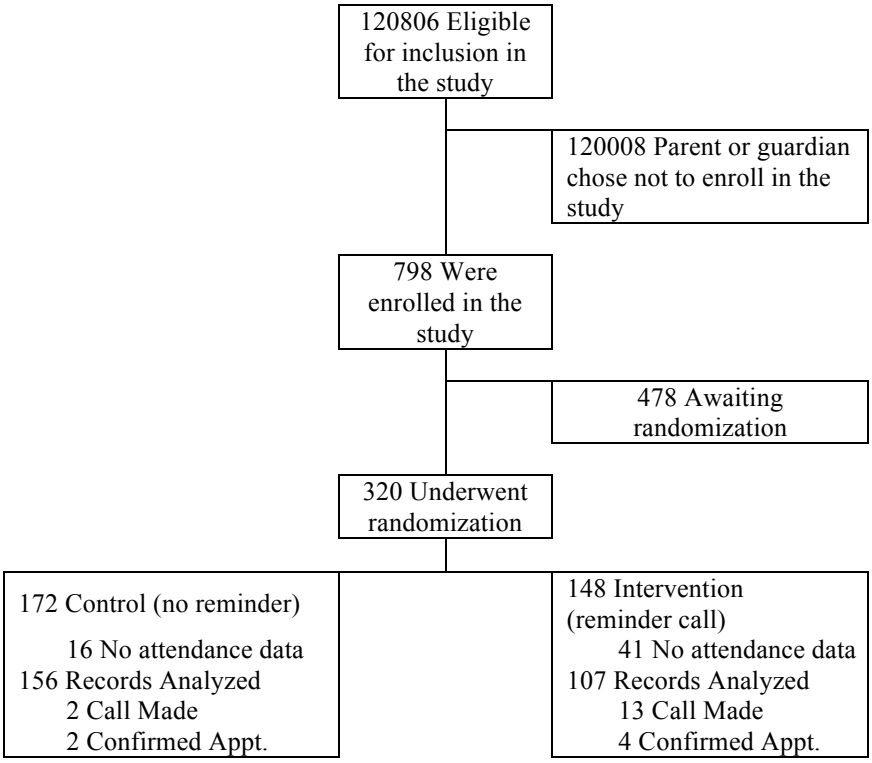
Data analysis was performed using Stata (version 12). The primary outcome was dichotomous attendance versus not attendance at Hospital Luis Calvo Mackenna (HLCM). Scheduled appointments that were cancelled by HLCM or the patient were considered successful attendance. Independent variables were divided into guardian, patient, household, appointment, and facility characteristics and rescaled if appropriate. Two studies of call impact were performed. First, in the trial analysis visits randomized to intervention or control were analyzed. Second, since data was also available across multiple years for trial participants, an observational analysis was also performed for any other visits in which data was available. Both new appointments (the initial referral visit to HLCM by the consultorio) and repeat appointment (ongoing treatment at HLCM) were included in both analyses.

First, the logistic command using the patient as the clustering variable (Huber/White robust variance estimator) and robust standard errors was performed for each independent variable. Since the data was clustered, the Wald test was used instead of the likelihood ratio test to confirm findings from the regression results. Additional variables were included in the multivariable model if found to be significant by Wald test or if postulated by the conceptual framework to impact attendance. Since most of the covariate patterns were unique, the Hosmer-Lemeshow fit test was used to assess the fit of each multivariate model. Next, multilevel models, using the xtmelogit command, were again utilized to account for nested data.

Study Participants (Trial Analysis)

The intervention was delivered during the study period starting in January 2014 and continued through the end of 2015 with appointment information included through December 2015. Server upgrades in July of 2015 resulted in no patients being randomized for this month (**Figure 5.1)**. Of all of the patients with appointments at HLCM during the study period, 798 enrolled in the study. Of those patients, 478 have not yet had their referral appointment. This left, at the time of analysis, 320 people who had undergone randomization, with 172 allocated to the control group and 148 to the intervention group. In the control group, 16 were awaiting appointments, so 156 records were available for analysis while in the intervention group, 41 were awaiting appointments, which resulted in 107 records available for analysis.

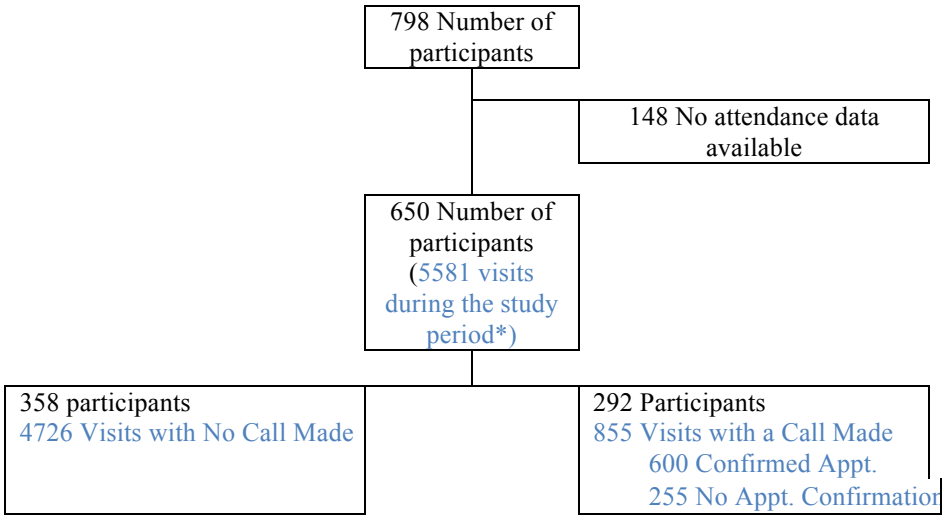
Figure 5.1: Enrollment and Randomization



Study Participants (Observational Analysis)

To evaluate the impact of the intervention in real use, all enrolled participants with appointment attendance data for any appointment were analyzed as part of the observational analysis (**Figure 5.2**). Of the 798 enrolled participants, 650 had attendance information available for a total of 5,581 appointments. Of these, a call was not successfully made for 4,726 appointments. Of the remaining 855 participants, 600 confirmed their appointments and 255 did not confirm.

Figure 5.2: Intervention Received for Observational Data



*Each participant (black) could contribute one or more visit (blue) to the No Call Made or Call Made groups.

Results

Section 1.0 Model Diagnostics

Independent variables were checked for colinearity by fitting a fake model then calculating the variance inflation factor (VIF). Since clinics are nested within communities, enrollment clinic and community were found to have high VIF values, so clinic was dropped and the values rechecked. The remaining variables were include since none had a VIF greater that 5 (**Appendix 5.1)**.

Section 1.1: Baseline Characteristic by Randomization Group

In the intention to treat analysis, there was no significant difference between the control and intervention groups with respect to baseline characteristics (**Appendix 5.2.1**). There were slightly more male participants (57.0%), half of the group having FONASA level A

insurance (55.9%), and a slight majority of patients coming from the Under 5 group (41.1%) as compared to 5-9 (33.1%) and 10 or older (25.9%). The majority of guardians in both groups were female (91.3%) and the patient's parent (93.5%). Very few patients had gotten to technical school or higher (16.0%) with most completing some preschool or less (34.9%) or primary or secondary school (48.3%). Half of guardians were single (51.9%) although those who were married or co-habitating made up a significant part of the sample (41.9 %). About a third working full time (33.2%), one third unemployed (32.9%) and one third were working part time (17.9%) or were home makers (16.0%). The most patients came from Penalolen (46.0%) with the least coming from Providencia (6.8%).

There were no significant differences between the control and intervention groups for visit characteristics, with the exception of visit type where more visits in the control group were new compared with the intervention group (60.3% vs. 42.1%; $p<0.01$) (**Appendix 5.2.2**). Most appointments were in the morning either at 9:59 or earlier (40.3) or 10:00-11:59 (38.8%) with approximately half occurring on Monday (25.5%) or Tuesday (25.5%). August (25.1%) had the most visits while January (1.1%) had the least. Most visits were with physicians (83.7%) with other non-physicians like nurses, physical therapists, dentists, and others making up the remaining visits (17.8%).

Section 1.2: Study Outcomes by Baseline Characteristic

With respect to patient characteristics (**Appendix 5.3.1**), there were no significant differences in attendance for gender, insurance levels, or age. Similarly, for guardian

characteristics, there were no differences in attendance rates by gender, relationship with patient, highest educational level started, marital status, occupation, or enrollment community.

Likewise, for visit characteristics (**Appendix 5.3.2**) there were no significant differences found for appointment type, time, day, month, or provider type.

Section 1.3: Study Outcomes by Randomization Group

In the univariate intention to treat analysis (**Table 5.1**), no difference was found in the odds of attendance for the intervention group as compared to the control group (OR=0.95; CI: 0.56-1.60). Within the intervention group (n=107), no differences were seen in attendance when a participant was actually called vs. not called (OR=0.57; CI: 0.17-1.89) or comparing when they confirmed their appointment vs. did not confirm (OR=0.51; CI: 0.07-3.86) although notably very few reminder calls were made (n=13) and amongst those, only 4 participants confirmed their appointments.

As none of the covariates were found to be significant, the patient, guardian, and household variables were included in the adjusted model since they were hypothesized to influence attendance in the conceptual framework. Additionally, appointment type was included since the distribution of new and repeat visits differed between the control and intervention group. In the adjusted analysis, no difference was found overall for control vs. intervention group (OR=0.96; CI: 0.54 - 1.71) and, within the intervention group, for call vs. no call (OR=0.53; CI: 0.6-1.76) or appointment confirmation (OR=0.23; CI: 0.04 - 1.32). A post-hoc power analysis was also conducted. It found lower power for both the

intention to treat arm (power=0.03) and for the actual intervention allocation arm (power=0.04) to be very low.

Table 5.1: Trial Outcomes by Treatment Group

		Attendance			Unadjusted Odds of Attendance	Adjusted Odds of Attendance¥
	Total N	N	%	95% CI	Odds Ratio (95% CI)	Odds Ratio (95% CI)
By Treatment Group						
Control	156	104	66.7%	(0.59-0.74)	Reference	Reference
Intervention	107	70	65.4%	(0.56-0.74)	0.95 (0.56 - 1.60)	0.96 (0.54 - 1.71)
By Intervention Received (Intervention Group Only)						
No Call Made	94	63	67.0%	(0.57-0.76)	Reference	Reference
Call Made	13	7	53.9%	(0.25-0.81)	0.57 (0.17 - 1.89)	0.53 (0.16 - 1.76)
By Appointment Confirmation (Intervention Group Only)						
No Appt. Confirmation	103	68	66.0%	(0.56-0.75)	Reference	Reference
Confirmed Appt.	4	2	50.0%	(0.07-0.93)	0.51 (0.07 - 3.86)	0.23 (0.04 - 1.32)

* $p<0.05$; ** $p<0.01$

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

Section 2.0: Observational Outcomes

All enrolled participants with appointment attendance data for any appointment were included in the observational data analysis. As in the trial, the VIF was once again calculated with all variables having an acceptably low level of colinearity except for clinic, which was removed from the analysis (**Appendix 5.4)**.

Section 2.1: Baseline Characteristic (Observational Data)

Most other variables in the observational data had similar overall distributions amongst each baseline characteristic as the trial data (**Appendix 5.5.1**). There was a significant difference, however, between these groups with respect to patient gender ($p<0.05$) with males making up a larger percentage of the not called group (55.6%) compared with the

called group (50.8%). Similarly, for insurance level ($p<0.01$) the not called group compared with the called group had more patients in Fonasa A (48.1% vs. 45.9%) and Fonasa D (17.5% vs. 11.8%) but less in Fonasa B (18.1% vs. 21.7%) and Fonasa C (13.6% vs. 17.5%). Most patients were under 5 (46.2%), more guardians were female (92.5%), the parent (91.2%), and had some primary or secondary school (48.6%) or preschool or less (33.9%). Guardians were mostly married or co-habitating (44.5%) or single or widowed (49.5%) with a third working full time (34.0%), one third unemployed (37.7%) and the rest working part time (15.4%) or were home makers (12.9%). The most patients came from Penalolen (49.5%) with the least coming from Providencia (6.2%).

With the exception of visit type where most slightly more visits were repeat visits overall (56.6%), visit characteristics were distributed differently by not called vs. called) (**Appendix 5.5.2**). Appointment times were generally later ($p<0.01$) in the not called compared to the called group with fewer in the 9:59 or earlier (34.2% vs. 40.2%) and 10:00-11:59 (39.1% vs. 39.%) compared with 12:00-13:59 (11.2% vs. 9.6%) and 14:00 or later (15.6% vs. 10.3%). Similarly, for appointment days ($p<0.01$), the not called group had a relatively larger percentage of Monday visits compared to the called group (23.9% vs. 19.7%). Similarly, for month ($p<0.01$), the not called group visits most frequently occurred in October (11.2%) and July (10.8%) while in the called group visits were most commonly in November (13.3%) and October (11.8%). For overall visits, the not called group had more participants with 21 or more visits compared with the not called group (49.7% vs. 44.9%; $p<0.01$). Finally, patients in the called group were much more likely

to have a visit with a physician than those in the not called group (89.1% vs. 70.5%; $p<0.01$)

Section 2.2: Study Outcomes by Baseline Characteristic

With respect to patient, guardian, and household characteristics (**Appendix 5.6.1**), there were again no significant differences in attendance. Most visit characteristics (**Appendix 5.6.2**) were also not related to attendance, with the exception of appointment month where patients in February (OR=0.60; CI: 0.39 - 0.94), July (OR=0.73; CI: 0.54-1.00), August (OR=0.65; CI: 0.48 - 0.89), September (OR=0.68; CI: 0.49 - 0.94), October (OR=0.60; CI: 0.45 - 0.81), and December (OR=0.65; CI: 0.46- 0.91) were less likely to attend than those in June.

Section 2.3: Study Outcomes by Intervention Received

No difference was found overall for no call vs. call (**Table 5.2**) for both unadjusted (OR=0.87; CI: 0.71-1.06) and in the model adjusted for patient, guardian, and household variables along with appointment type (OR=0.87; CI: 0.71-1.06). However, amongst those who were called, those who confirmed their appointment, were much more likely to attend their appointment than those who had not confirmed their appointment in both the unadjusted (OR=3.12; CI: 2.14-4.53) and multivariate models (OR=3.21; CI: 2.17-4.76). This effect was similar but less strong when comparing the group that confirmed their appointment with any others, whether they were called or not, both in unadjusted (OR=1.33; CI: 1.05-1.69) and adjusted models (OR=1.36; CI: 1.06-1.75).

Table 5.2: Outcomes by Intervention Received						
		Attendance			Unadjusted Odds of Attendance	Adjusted Odds of Attendance¥
	Total N	N	%	95% CI	Odds Ratio (95% CI)	Odds Ratio (95% CI)
By Called Group						
No Call Made	4,726	3707	78.4%	(0.77-0.8)	Reference	Reference
Call Made	855	652	76.3%	(0.73-0.79)	0.85 (0.70 - 1.02)	0.87 (0.71 - 1.06)
By Appointment Confirmation (Called Group Only)						
No Appt. Confirmation	255	158	62.0%	(0.56-0.68)	Reference	Reference
Confirmed Appt.	600	494	82.3%	(0.79-0.85)	3.12 (2.14 - 4.53)**	3.21 (2.17 - 4.76)**
By Appointment Confirmation (All Observational Data)						
No Appt. Confirmation	4,981	3865	77.6%	(0.76-0.79)	Reference	Reference
Confirmed Appt.	600	494	82.3%	(0.79-0.85)	1.33 (1.05 - 1.69)*	1.36 (1.06 - 1.75)*

* p<0.05; ** p<0.01

¥ Adjusted for patient characteristics (gender, FONASA, age), guardian characteristics (gender, relationship with patient, education, marital status, highest level started, occupation, community at enrollment), and visit type (new vs. repeat)

Discussion

The objective of this study was to determine whether the Health Call system could reduce missed appointments. When the appointment reminder was actually delivered, reminder calls significantly reduced the number of missed appointments, taking into account patient, guardian, and appointment characteristics. However, they had no impact on attendance when patients were simply selected to receive a reminder call or called without delivery of the reminder.

The results from both the trial and observational data indicated that only successfully receiving the reminder reduced the FTA rate. While small sample size by stratification level impacted the estimates for some variables particularly in the trial analysis, there is some suggestion, albeit not significant in either analysis, that being called may potentially

reduced the likelihood of attendance for certain types of patients. This result was also suggested by comparing results from the call made and confirmation groups, where robust differences in attendance for those who confirmed their appointment vs. not amongst those called were less pronounced when comparing those who confirmed their appointment with all other visits, whether they were called or not. In both cases, being called, but not confirming an appointment, seemed to reduce likelihood of attendance. As some of those who received the call and just listened to the initial introduction, which was identified as coming from HLCM, were hypothesized to be more likely to attend, this result is unexpected.

A potential explanation would be differential allocation of patient characteristics across the comparison arms of the control vs. intervention or not called vs. called, although the trends persisted despite adjustment for the majority of hypothesized and empirically selected covariates. Analysis of the call data also indicated that, outside of the study, a significant number of other reminder calls were made to participants. Accordingly, participants may have experienced reminder fatigue where an initially effective reminder system may, over the course of multiple prior contacts, been subsequently ignored by recipients. This is potentially applicable not only in understanding why the reminder impacts reported elsewhere, a median absolute reduction of 7.0% [Interquartile range: 4.2-11.5%] across 29 studies reviewed in one meta-analysis (Hasvold & Wootton, 2011) may reflect effects that are relatively temporary(Hanauer, Wentzell, Laffel, & Laffel, 2009).

In the confirmed vs. not confirmed analyses, the reminders were effective in reducing the number of missed for those who confirmed their appointment as opposed to those were called and did not confirm their appointment, or who simply didn't confirm at all whether they were called or not. This is in accordance with most published results reviewed for this study and suggests that, when delivered, reminders increase awareness of appointments and improve attendance (Carrion, Swann, Kellert-Cecil, & Barber, 1993; Crawford et al., 2005; Gurol-Urganci, de Jongh, Vodopivec-Jamsek, Atun, & Car, 2008; Hasvold & Wootton, 2011; Haynes & Sweeney, 2006; Herrick, Gilhooly, & Geddes, 1994; Hon, Leung, Wong, Ma, & Fok, 2005; Hull, Alexander, Morrison, & McKinnon, 2002; Mohamed & Al-Doghaither, 2002; Mollon et al., 2008; Murdock, Rodgers, Lindsay, & Tham, 2002; Neal, Hussain-Gambles, Allgar, Lawlor, & Dempsey, 2005; Pal, Taberner, Readman, & Jones, 1998; Potamitis, Chell, Jones, & Murray, 1994; Reidel, Tamblyn, Patel, & Huang, 2008; Richardson, 1998; Skaret, Raadal, Kvale, & Berg, 2000; Tierney et al., 2003; Zailinawati, Ng, & Nik-Sherina, 2006). The lack of impact for those who were called but didn't receive the reminder, however, could imply that hearing the beginning of the call from HLCM was not effective and that, instead, something in the process of confirming or hearing the appointment reminder was key. It could also suggest that the process of completing the security screen by correctly confirming information about the pediatric patient could be preventing many from receiving the reminder messages. Whether these impacts are mediated via who received the call, dynamics of the call itself, perceptions of the appointment or hospital, or by other means is unclear.

Prior studies have implicated differences in baselines characteristics as direct drivers of differences in attendance and as indirect drivers of attendance through their impact on contactability and subsequent reminder delivery (Roberts, Meade, & Partridge, 2007). There were several differences in terms of baselines characteristics, although adjusting for these variables did not significantly change the direction or degree of the reported effects. Thus, it was unlikely that these independently explained the impact of the intervention for those who received the reminders.

The results from this study suggest an important but unrealized potential for impact of patient reminder systems. In this study, participants were able to be called only for about $1/6^{th}$ of the overall number of visits available and less than 1/2 of these participants, when called, confirmed their identity and received the reminder. This was particularly true in the intention to treat analysis where only 13/107 participants in the intervention group were able to be called. A lack of contact information remains a critical limitation for any effective reminder system.

Given the amount of phone contact that happens across the health system, a top priority should be improving access to accurate contact information. Several concrete changes could improve system function:

First, a review of data updating practices across the different consultorios should be undertaken. Existing practices should be described amongst a representative or even complete sample of the consultorios and analyzed before new policies are implemented.

Second, guardians should be interviewed regarding both reasons the health system might not have correct contact information for them and potential ways to increase contact information accuracy. Third, once opinions are collected, staff and patient-drive policies should be explored. Incentivizing increased staff entry at consultorios might be the most logical location for updating contact information especially since this is the index contact for a given follow-up appointment. Given the limited ability of health system staffers to reach clients once they have left the facility, and especially if they have changed phone numbers, even updating information at the time of appointment does not guarantee receiving information that is accurate at the time of entry or, more importantly, at the time of future contacts. Here, considering policies or systems that incentivizes client-driven updating of contact information may be worth exploring.

Limitations

While this study was designed as a randomized controlled trial, multiple aspects of implementing in an evolving health system significantly impacted the study. First, there was a clear need to balance burdensome collection processes and representative study populations and data. Shorter questionnaires made for faster enrollment but they reduced the breadth of the data available for analysis. Electronic medical records were also a useful data source but were often incomplete.

Many participants were unwilling to complete long questionnaires or undergo lengthy consent processes, resulting in small sample sizes and, due to insufficient observations, unstable estimations. Choosing to collect data suggested by the literature as pertinent but

not regularly available in the HLCM electronic medical record represented a trade off between exploring potentially relevant data and what is existing decision relevant data. When attendance was related to additional variables, like guardian characteristics and health beliefs, the health system would be unable to take advantage of these results without themselves collecting additional data points. Conversely, some of these data points may still be irrelevant in practice. Attempting to identify who receives the reminder call may be less important since, in practice, these calls can likely and easily be received by any member of the household, complicating the meaning of any associations even if they had been found.

Third, the system was implemented at scale before trial results were available. This may reflect the influence of other data points and timeframes that were sufficiently salient for health system implementers but were not adequately taken into account in the choice of study design or timeline. The implementation of the system outside the bounds of the study meant that participants may have been exposed to the reminder system at other times or for other visits, potentially raising their awareness of appointments diminishing the impact of the reminders and leaving the true effect undetected.

Conclusions

Health systems often use reminder systems to reduce the number of missed appointments and thereby improve efficiency. Interactive voice response systems, like Health Call, have been proposed as a way to simulate the personal touch of phone calls while reducing the calling burden on staff, particularly in high-volume, low resource settings. Multiple

trials of these systems have been conducted, primarily in high-income, English speaking countries where similar interactive technologies may already be used in other sectors. This study set out to understand whether Health Call could improve patient attendance by assessing performance through a randomized controlled trial and through an observational study of attendance outcomes during actual system use.

Overall, the system had no impact in trial and observational use, although it did improve attendance for the subset of patients who successfully completed the security questions and received the reminder. Results from this trial, as well as those from many prior studies, suggest that the attendance outcomes these systems claim to deliver should be viewed with considerable caution. This trial illustrates many of the considerable gaps between ideal and actual use. Gaining the significant improvements in attendance suggested by the called vs. not called groups requires investing in better data management systems, improving data quality and entry, maintaining up to date contact information, and potentially modifying the calling interface or security screening system. These hidden costs and their potential impact on attendance are rarely, if ever, accounted for in trials of reminder systems.

Investigator approaches can help health systems make more informed decisions by employing evaluation strategies that mimic actual implementation. The randomized trial used in this study helped account for selection bias but was complex to administer, was limited by a small sample size, and had uncertain generalizability. Conversely, the longitudinal analysis gave a clear indication of performance over time but participants in

that group were not similar to other participants in potentially important ways, like socioeconomic status. Given these important limitations, future health system trials could consider alternate evaluation approaches that compare relevant units of analysis, provide adequate sample sizes, and reduce the need for highly sophisticated implementation. Step-wedge trials, where an intervention is phased in to use sequentially across a series of large units like communities, facilities, or departments, could be a useful way to analyze impact both between units and, through before and after analyses, within a given unit. Cluster randomization, where units instead of people are randomized to intervention or control, also allow for similar analyses. Factorial designs, where the units of evaluation are assigned to different combinations of an intervention (i.e. more calls, different timing of reminders etc.) and compared, may combine advantages of both approaches while providing evidence on the timing and combination of interventions that are most effective. These designs may offer future planners more of the context and implementation relevant evidence that this, and other trials, tend to lack.

Ultimately, the challenge for this and other evaluations is isolating and distilling a variety of hypothesized cause-effect relationships within a health system that is constantly evolving. The approaches described above, especially when complemented by other types of data collection, like longitudinal and qualitative data collection, may provide necessary complimentary data. Whatever evaluation approach is ultimately used to evaluate systems like Health Call will need to employ methods that reflect the complexity of the target implementation context.

Appendices

Appendix 5.1: Variance Inflation Factor (Trial Data)		
Category	**Variable**	**VIF**
Patient, Guardian, & Household Characteristics	Gender	1.05
	FONASA	1.24
	Age at Appointment	1.16
	Gender	1.11
	Relationship with Patient	1.1
	Education	1.28
	Marital Status	1.1
	Employment	1.28
	Community	1.11
Appointment & Provider Characteristics	Type	1.22
	Time	1.16
	Day	1.09
	Month	1.16
	Total Visits	1.1
	Provider type	1.11

Appendix 5.2.1: Population Characteristics by Randomization Group							
Patient Characteristics	Control Group		Intervention Group		Total		Chi
	N	%	N	%	N	%	(Pr)
Gender							
Female	65	41.7%	48	44.9%	113	43.0%	(0.61)
Male	91	58.3%	59	55.1%	150	57.0%	0.26
FONASA							
Group A	86	55.1%	61	57.0%	147	55.9%	
Group B	31	19.9%	15	14.0%	46	17.5%	
Group C	14	9.0%	13	12.2%	27	10.3%	
Group D	23	14.7%	13	12.2%	36	13.7%	4.96
Other	2	1.3%	5	4.7%	7	2.7%	(0.29)
Apt Age (Cat)							
Under 5	63	40.4%	45	42.1%	108	41.1%	
5-9	56	35.9%	31	29.0%	87	33.1%	1.64
10 or older	37	23.7%	31	29.0%	68	25.9%	(0.44)
Guardian Characteristics	Control Group		Intervention Group		Total		Chi
	N	%	N	%	N	%	(Pr)
Gender							0.03
Female	142	91.0%	98	91.6%	240	91.3%	(0.87)
Male	14	9.0%	9	8.4%	23	8.8%	
Relationship with Patient							
Parent	144	92.3%	102	95.3%	246	93.5%	(0.33)
Other Guardian	12	7.7%	5	4.7%	17	6.5%	0.96
Highest Level Started							
Preschool or less	58	37.4%	33	31.1%	91	34.9%	
Primary or Secondary	70	45.2%	56	52.8%	126	48.3%	1.55
Technical School or more	27	17.4%	17	16.0%	44	16.9%	(0.46)
Marital Status							
Married or Co-habitating	67	43.5%	42	39.6%	109	41.9%	
Single or Widowed	80	52.0%	55	51.9%	135	51.9%	1.81
Separated or Divorced	7	4.6%	9	8.5%	16	6.2%	(0.4)
Occupation							
Full time	49	32.0%	34	32.7%	83	32.3%	
Part time	31	20.3%	20	19.2%	51	19.8%	
Unemployed	51	33.3%	34	32.7%	85	33.1%	0.09
Home Maker	22	14.4%	16	15.4%	38	14.8%	(0.99)
Community at Enrollment							
La Reina	16	10.3%	15	14.0%	31	11.8%	
Penalolen	75	48.1%	46	43.0%	121	46.0%	
Providencia	9	5.8%	9	8.4%	18	6.8%	
Macul	23	14.7%	16	15.0%	39	14.8%	
Lo Barnechea	18	11.5%	9	8.4%	27	10.3%	2.53
Nunoa	15	9.6%	12	11.2%	27	10.3%	(0.77)
* $p<0.05$; ** $p<0.01$							

Appendix 5.2.2: Visit Characteristics by Randomization Group							
Appointment and Provider Characteristics	Control Group		Intervention Group		Total		Chi
	N	%	N	%	N	%	(Pr)
Type**							
Repeat	62	39.7%	62	57.9%	124	47.2%	8.44
New	94	60.3%	45	42.1%	139	52.9%	(0)
Time							
09:59 or earlier	69	44.2%	37	34.6%	106	40.3%	
10:00-11:59	59	37.8%	43	40.2%	102	38.8%	
12:00-13:59	13	8.3%	15	14.0%	28	10.7%	3.64
14:00 or later	15	9.6%	12	11.2%	27	10.3%	(0.3)
Day							
Monday	47	30.1%	20	18.7%	67	25.5%	
Tuesday	36	23.1%	31	29.0%	67	25.5%	
Wednesday	25	16.0%	18	16.8%	43	16.4%	
Thursday	26	16.7%	21	19.6%	47	17.9%	4.6
Friday	22	14.1%	17	15.9%	39	14.8%	(0.33)
Month							
January	2	1.3%	1	0.9%	3	1.1%	
February	4	2.6%	2	1.9%	6	2.3%	
March	8	5.1%	5	4.7%	13	4.9%	
April	10	6.4%	4	3.7%	14	5.3%	
May	11	7.1%	6	5.6%	17	6.5%	
June	8	5.1%	11	10.3%	19	7.2%	
July	0	0.0%	0	0.0%	0	0.0%	
August	38	24.4%	28	26.2%	66	25.1%	
September	23	14.7%	12	11.2%	35	13.3%	
October	13	8.3%	14	13.1%	27	10.3%	
November	27	17.3%	17	15.9%	44	16.7%	5.88
December	12	7.7%	7	6.5%	19	7.2%	(0.83)
Total Visits							
1 to 5	50	32.1%	27	25.2%	77	29.3%	
6 to 10	41	26.3%	23	21.5%	64	24.3%	
11 to 20	32	20.5%	30	28.0%	62	23.6%	3.59
21 or more	33	21.2%	27	25.2%	60	22.8%	(0.31)
Provider Type							
Non-Physician	24	15.4%	19	17.8%	43	16.4%	0.26
Physician	132	84.6%	88	82.2%	220	83.7%	(0.61)
* $p<0.05$; ** $p<0.01$							

Appendix 5.3.1: Population Characteristics and Attendance						
		Attendance			Unadjusted Odds of Attendance	
Patient	Total N	N	%	95% CI	Odds Ratio	95% CI
Gender						
Female	113	78	69.0%	(0.6-0.77)	Reference	
Male	150	96	64.0%	(0.56-0.72)	1.25	(0.74 - 2.14)
FONASA						
Group A	147	97	66.0%	(0.58-0.74)	Reference	
Group B	46	31	67.4%	(0.52-0.8)	1.07	(0.52 - 2.18)
Group C	27	19	70.4%	(0.5-0.86)	1.22	(0.47 - 3.21)
Group D	36	24	66.7%	(0.49-0.81)	1.03	(0.47 - 2.26)
Other	7	3	42.9%	(0.1-0.82)	0.39	(0.06 - 2.33)
Apt Age (Cat)						
Under 5	108	74	68.5%	(0.59-0.77)	Reference	
5-9	87	59	67.8%	(0.57-0.77)	0.97	(0.52 - 1.79)
10 or older	68	41	60.3%	(0.48-0.72)	0.70	(0.36 - 1.36)
Guardian and Household	Total N	N	%	95% CI	Odds Ratio	95% CI
Gender						
Female	240	159	66.3%	(0.6-0.72)	Reference	
Male	23	15	65.2%	(0.43-0.84)	1.05	(0.40 - 2.73)
Relationship with Patient						
Parent	246	166	67.5%	(0.61-0.73)	Reference	
Other Guardian	17	8	47.1%	(0.23-0.72)	2.33	(0.82 - 6.68)
Highest Level Started						
Preschool or less	91	61	67.0%	(0.56-0.77)	Reference	
Primary or Secondary	126	82	65.1%	(0.56-0.73)	0.92	(0.51 - 1.64)
Technical School or more	44	30	68.2%	(0.52-0.81)	1.05	(0.48 - 2.31)
Marital Status						
Married or Co-habitating	109	75	68.8%	(0.59-0.77)	Reference	
Single or Widowed	135	90	66.7%	(0.58-0.75)	0.91	(0.52 - 1.58)
Separated or Divorced	16	8	50.0%	(0.25-0.75)	0.45	(0.16 - 1.31)
Occupation						
Full time	83	57	68.7%	(0.58-0.78)	Reference	
Part time	51	30	58.8%	(0.44-0.72)	0.65	(0.30 - 1.42)
Unemployed	85	54	63.5%	(0.52-0.74)	0.79	(0.42 - 1.51)
Home Maker	38	29	76.3%	(0.6-0.89)	1.47	(0.61 - 3.55)
Community at Enrollment						
La Reina	31	19	61.3%	(0.42-0.78)	0.72	(0.32 - 1.65)
Penalolen	121	83	68.6%	(0.6-0.77)	Reference	
Providencia	18	11	61.1%	(0.36-0.83)	0.72	(0.26 - 2.00)
Macul	39	23	59.0%	(0.42-0.74)	0.66	(0.31 - 1.39)
Lo Barnechea	27	21	77.8%	(0.58-0.91)	1.60	(0.60 - 4.30)
Nunoa	27	17	63.0%	(0.42-0.81)	0.78	(0.33 - 1.86)
* $p<0.05$; ** $p<0.01$						

Appendix 5.3.2: Visit Characteristics and Attendance						
		Attendance			Unadjusted Odds of Attendance	
Appointment and Provider	Total N	N	%	95% CI	Odds Ratio	95% CI
Type						
Repeat	124	86	69.4%	(0.6-0.77)	Reference	
New	139	88	63.3%	(0.55-0.71)	0.76	(0.45 - 1.28)
Time						
09:59 or earlier	106	69	65.1%	(0.55-0.74)	Reference	
10:00-11:59	102	68	66.7%	(0.57-0.76)	1.07	(0.61 - 1.89)
12:00-13:59	28	18	64.3%	(0.44-0.81)	0.97	(0.40 - 2.31)
14:00 or later	27	19	70.4%	(0.5-0.86)	1.27	(0.52 - 3.09)
Day						
Monday	67	45	67.2%	(0.55-0.78)	Reference	
Tuesday	67	48	71.6%	(0.59-0.82)	1.24	(0.58 - 2.64)
Wednesday	43	29	67.4%	(0.51-0.81)	1.01	(0.45 - 2.29)
Thursday	47	29	61.7%	(0.46-0.75)	0.79	(0.36 - 1.73)
Friday	39	23	59.0%	(0.42-0.74)	0.70	(0.31 - 1.61)
Month						
January	3	1	33.3%	(0.01-0.91)	0.23	(0.02 - 3.09)
February	6	3	50.0%	(0.12-0.88)	0.46	(0.07 - 3.01)
March	13	12	92.3%	(0.64-1)	5.54	(0.58 - 53.18)
April	14	9	64.3%	(0.35-0.87)	0.83	(0.19 - 3.59)
May	17	10	58.8%	(0.33-0.82)	0.66	(0.17 - 2.59)
June	19	13	68.4%	(0.43-0.87)	Reference	
July	0	0	0.0%	(0-0)		
August	66	40	60.6%	(0.48-0.72)	0.71	(0.24 - 2.11)
September	35	22	62.9%	(0.45-0.79)	0.78	(0.24 - 2.56)
October	27	17	63.0%	(0.42-0.81)	0.78	(0.23 - 2.73)
November	44	31	70.5%	(0.55-0.83)	1.10	(0.34 - 3.53)
December	19	16	84.2%	(0.6-0.97)	2.46	(0.51 - 11.83)
Provider Type						
Physician	220	142	64.5%	(0.58-0.71)	Reference	
Non-Physician	43	32	74.4%	(0.59-0.86)	0.63	(0.31 - 1.28)
* $p<0.05$; ** $p<0.01$						

Appendix 5.4: Variance Inflation Factor (Observational Data)		
Category	**Variable**	**VIF**
Patient, Guardian, & Household Characteristics	Gender	1.08
	FONASA	1.13
	Age at Appointment	1.14
	Gender	1.10
	Relationship with Patient	1.05
	Education	1.09
	Marital Status	1.04
	Employment	1.19
	Community	1.04
Appointment & Provider Characteristics	Type	1.19
	Time	1.11
	Day	1.01
	Month	1.01
	Total Visits	1.17
	Provider type	1.09

Appendix 5.5.1: Population Characteristics by Intervention Received							
Patient Characteristics	Not Called		Called		Total		Chi
	N	%	N	%	N	%	(Pr)
Gender							
Female	2,091	44.5%	419	49.2%	2,510	45.2%	6.51*
Male	2,613	55.6%	433	50.8%	3,046	54.8%	(0.01)
FONASA							
Group A	2,087	48.1%	359	45.9%	2,446	47.7%	
Group B	784	18.1%	170	21.7%	954	18.6%	
Group C	592	13.6%	137	17.5%	729	14.2%	
Group D	758	17.5%	92	11.8%	850	16.6%	25.82**
Other	121	2.8%	25	3.2%	146	2.9%	(0)
Apt Age (Cat)							
Under 5	2,185	46.2%	395	46.2%	2,580	46.2%	
5-9	1,437	30.4%	250	29.2%	1,687	30.2%	0.77
10 or older	1,104	23.4%	210	24.6%	1,314	23.5%	(0.68)
Guardian and Household Characteristics	Called		Not Called		Total		Chi
	N	%	N	%	N	%	(Pr)
Gender							
Male	351	7.4%	70	8.2%	421	7.5%	0.60
Female	4,375	92.6%	785	91.8%	5,160	92.5%	(0.44)
Relationship with Patient							
Other Guardian	423	9.0%	70	8.2%	493	8.8%	0.52
Parent	4,303	91.1%	785	91.8%	5,088	91.2%	(0.47)
Highest Level Started							
Preschool or less	1,580	33.5%	307	35.9%	1,887	33.9%	
Primary or Secondary	2,286	48.5%	418	48.9%	2,704	48.6%	4.39
Technical School or more	847	18.0%	130	15.2%	977	17.6%	(0.11)
Marital Status							
Married or Co-habitating	2,051	43.9%	405	47.5%	2,456	44.5%	
Single or Widowed	2,330	49.9%	403	47.3%	2,733	49.5%	4.16
Separated or Divorced	291	6.2%	45	5.3%	336	6.1%	(0.13)
Occupation							
Full time	1,553	33.7%	300	35.8%	1,853	34.0%	
Part time	691	15.0%	146	17.4%	837	15.4%	
Unemployed	1,766	38.3%	292	34.8%	2,058	37.7%	6.54
Home Maker	605	13.1%	101	12.0%	706	12.9%	(0.09)
Community at Enrollment							
La Reina	489	10.4%	97	11.4%	586	10.5%	
Penalolen	2347	49.7%	417	48.8%	2764	49.5%	
Providencia	293	6.2%	50	5.9%	343	6.2%	
Macul	647	13.7%	119	13.9%	766	13.7%	
Lo Barnechea	469	9.9%	70	8.2%	539	9.7%	5.36
Nunoa	481	10.2%	102	11.9%	583	10.5%	(0.37)
* p<0.05; ** p<0.01							

Appendix 5.5.2: Visit Characteristics by Called Group							
Visit Characteristics	Not Called		Called		Total		Chi
	N	%	N	%	N	%	(Pr)
Type							
Repeat	2,649	56.1%	507	59.3%	3,156	56.6%	3.11
New	2,077	44.0%	348	40.7%	2,425	43.5%	(0.08)
Time							
09:59 or earlier	1,616	34.2%	344	40.2%	1,960	35.1%	
10:00-11:59	1,846	39.1%	341	39.9%	2,187	39.2%	
12:00-13:59	527	11.2%	82	9.6%	609	10.9%	23.03**
14:00 or later	737	15.6%	88	10.3%	825	14.8%	(0)
Day							
Monday	1,127	23.9%	168	19.7%	1,295	23.2%	
Tuesday	1,136	24.0%	224	26.2%	1,360	24.4%	
Wednesday	825	17.5%	133	15.6%	958	17.2%	
Thursday	945	20.0%	195	22.8%	1,140	20.4%	11.85*
Friday	692	14.7%	135	15.8%	827	14.8%	(0.02)
Month							
January	230	4.9%	48	5.6%	278	5.0%	
February	139	2.9%	33	3.9%	172	3.1%	
March	370	7.8%	54	6.3%	424	7.6%	
April	412	8.7%	71	8.3%	483	8.7%	
May	414	8.8%	67	7.8%	481	8.6%	
June	457	9.7%	83	9.7%	540	9.7%	
July	508	10.8%	76	8.9%	584	10.5%	
August	470	9.9%	65	7.6%	535	9.6%	
September	425	9.0%	61	7.1%	486	8.7%	
October	528	11.2%	101	11.8%	629	11.3%	33.52**
November	446	9.4%	114	13.3%	560	10.0%	(0)
December	327	6.9%	82	9.6%	409	7.3%	
Total Visits							
1 to 5	779	16.5%	94	11.0%	873	15.6%	
6 to 10	767	16.2%	139	16.3%	906	16.2%	
11 to 20	1057	22.4%	197	23.0%	1254	22.5%	17.73**
21 or more	2123	44.9%	425	49.7%	2548	45.7%	(0)
Provider Type							
Non-Physician	1,391	29.5%	93	10.9%	1,484	26.6%	127.03**
Physician	3,331	70.5%	759	89.1%	4,090	73.4%	(0)
* p<0.05; ** p<0.01							

Appendix 5.6.1: Observational Characteristics and Attendance						
		Attendance			Unadjusted Odds of Attendance	
Patient	Total N	N	%	95% CI	Odds Ratio	95% CI
Gender						
Female	2510	1972	78.6%	(0.77-0.8)	Reference	
Male	3046	2368	77.7%	(0.76-0.79)	1.00	(0.82 - 1.22)
FONASA						
Group A	2446	1871	76.5%	(0.75-0.78)	Reference	
Group B	954	752	78.8%	(0.76-0.81)	1.18	(0.90 - 1.55)
Group C	729	591	81.1%	(0.78-0.84)	1.25	(0.92 - 1.70)
Group D	850	658	77.4%	(0.74-0.8)	1.26	(0.95 - 1.68)
Other	146	120	82.2%	(0.75-0.88)	1.24	(0.70 - 2.19)
Apt Age (Cat)						
Under 5	2580	1986	77.0%	(0.75-0.79)	Reference	
5-9	1687	1326	78.6%	(0.77-0.81)	1.01	(0.83 - 1.24)
10 or older	1314	1047	79.7%	(0.77-0.82)	0.96	(0.75 - 1.23)
Guardian and Household	Total N	N	%	95% CI	Odds Ratio	95% CI
Gender						
Female	5160	4027	78.0%	(0.77-0.79)	Reference	
Male	421	332	78.9%	(0.75-0.83)	0.91	(0.63 - 1.32)
Relationship with Patient						
Parent	5088	3978	78.2%	(0.77-0.79)	Reference	
Other Guardian	493	381	77.3%	(0.73-0.81)	1.11	(0.80 - 1.56)
Highest Level Started						
Preschool or less	1887	1447	76.7%	(0.75-0.79)	Reference	
Primary or Secondary	2704	2153	79.6%	(0.78-0.81)	1.09	(0.87 - 1.35)
Technical School or more	977	750	76.8%	(0.74-0.79)	1.02	(0.77 - 1.37)
Marital Status						
Married or Co-habitating	2456	1939	78.9%	(0.77-0.81)	Reference	
Single or Widowed	2733	2107	77.1%	(0.75-0.79)	0.91	(0.74 - 1.12)
Separated or Divorced	336	269	80.1%	(0.75-0.84)	1.07	(0.66 - 1.73)
Occupation						
Full time	1853	1482	80.0%	(0.78-0.82)	Reference	
Part time	837	639	76.3%	(0.73-0.79)	0.75	(0.56 - 1.01)
Unemployed	2058	1564	76.0%	(0.74-0.78)	0.79	(0.62 - 1.01)
Home Maker	706	569	80.6%	(0.77-0.83)	1.00	(0.73 - 1.38)
Community at Enrollment						
La Reina	586	466	79.5%	(0.76-0.83)	1.24	(0.89 - 1.74)
Penalolen	2764	2153	77.9%	(0.76-0.79)	Reference	
Providencia	343	270	78.7%	(0.74-0.83)	1.28	(0.85 - 1.93)
Macul	766	615	80.3%	(0.77-0.83)	1.16	(0.86 - 1.56)
Lo Barnechea	539	418	77.6%	(0.74-0.81)	1.14	(0.80 - 1.62)
Nunoa	583	437	75.0%	(0.71-0.78)	0.86	(0.63 - 1.19)
* $p<0.05$; ** $p<0.01$						

Appendix 5.6.2: Visit Characteristics and Attendance						
		Attendance			Unadjusted Odds of Attendance	
Appointment and Provider	Total N	N	%	95% CI	Odds Ratio	95% CI
Type						
Repeat	3156	2508	79.5%	(0.78-0.81)	Reference	
New	2425	1851	76.3%	(0.75-0.78)	0.91	(0.79 - 1.05)
Time						
09:59 or earlier	1960	1505	76.8%	(0.75-0.79)	Reference	
10:00-11:59	2187	1721	78.7%	(0.77-0.8)	1.07	(0.91 - 1.26)
12:00-13:59	609	486	79.8%	(0.76-0.83)	1.19	(0.93 - 1.51)
14:00 or later	825	647	78.4%	(0.75-0.81)	1.07	(0.86 - 1.34)
Day						
Monday	1295	999	77.1%	(0.75-0.79)	Reference	
Tuesday	1360	1079	79.3%	(0.77-0.81)	1.12	(0.92 - 1.37)
Wednesday	958	749	78.2%	(0.75-0.81)	1.03	(0.83 - 1.28)
Thursday	1140	892	78.2%	(0.76-0.81)	1.08	(0.88 - 1.33)
Friday	827	639	77.3%	(0.74-0.8)	1.02	(0.81 - 1.28)
Month						
January	278	234	84.2%	(0.79-0.88)	1.13	(0.75 - 1.70)
February	172	128	74.4%	(0.67-0.81)	0.60	(0.39 - 0.94)*
March	424	344	81.1%	(0.77-0.85)	0.91	(0.64 - 1.29)
April	483	383	79.3%	(0.75-0.83)	0.86	(0.62 - 1.19)
May	481	381	79.2%	(0.75-0.83)	0.85	(0.61 - 1.18)
June	540	441	81.7%	(0.78-0.85)	Reference	
July	584	451	77.2%	(0.74-0.81)	0.73	(0.54 - 1.00)*
August	535	403	75.3%	(0.71-0.79)	0.65	(0.48 - 0.89)**
September	486	371	76.3%	(0.72-0.8)	0.68	(0.49 - 0.94)*
October	629	461	73.3%	(0.7-0.77)	0.60	(0.45 - 0.81)**
November	560	451	80.5%	(0.77-0.84)	0.91	(0.66 - 1.26)
December	409	311	76.0%	(0.72-0.8)	0.65	(0.46 - 0.91)*
Total Visits						
1 to 5	873	661	75.7%	(0.73-0.79)	Reference	
6 to 10	906	707	78.0%	(0.75-0.81)	1.12	(0.85 - 1.48)
11 to 20	1254	965	77.0%	(0.75-0.79)	1.06	(0.81 - 1.39)
21 or more	2548	2026	79.5%	(0.78-0.81)	1.20	(0.92 - 1.57)
Provider Type						
Physician	4090	3154	77.1%	(0.76-0.78)	Reference	
Non-Physician	1484	1198	80.7%	(0.79-0.83)	0.84	(0.71 - 1.00)
* $p<0.05$; ** $p<0.01$						

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Chapter 6: Parent and Provider Perspectives: Perceptions and misperceptions of missed appointments from around the health system

Study Objectives

This qualitative study is part of a larger primarily quantitative study on pediatric referral appointments or "interconsultas" in Santiago, Chile. The parallel quantitative arms of the overarching study focused on whether patient and guardian characteristics and health beliefs relate to appointment attendance in cross section or over time, and whether the Health Call system, and interactive voice response system, improved attendance in a randomized controlled trial and/or in actual use.

Complementing the studies noted above, this qualitative arm of the overarching study sought to understand experiences and opinions on patient attendance, from the perspectives of patient guardians and healthcare providers, with the aim of triangulating, deepening and contextualizing quantitative results, as well as informing recommendations to improve pediatric health appointment attendance at a referral pediatric hospital, Luis Calvo Mackenna (HLCM) in Santiago, Chile(Lewin, Glenton, & Oxman, 2009; Rapport et al., 2013). Specifically, this applied research study set out to 1) Determine what factors, processes, actors, and values that impact patient attendance; 2) Capture existing ways health system schedulers, physicians, administrators, and medical directors (hereto called "staff") are currently working to improve patient attendance; and 3) Identify new opportunities for improving attendance. To do so, this applied research evaluation study used in-depth open-ended interviews and analyzed resulting data through analytic inductive and deductive analysis (Patton, 2002).

In the sections below, an overview of the study context, conceptual framework, methodology and methods is provided followed by analysis and discussion of findings. Ultimately, despite important limitations, implications of this study have the potential to enhance the effectiveness of the pediatric appointment scheduling system in Chile, as well as inform future appointment reminder interventions and scheduling practices in this setting.

Study Context

This study was conducted in the facilities that form HLCM's catchment area, the same locations that were used in the parallel quantitative studies. HLCM is located roughly in the center of Santiago with the communities and facilities that form its main catchment area distributed throughout the southeast region of the city. Each municipality in Santiago, Chile, has 1-6 basic health centers or consultorios, with the study's 16 total facilities representing about 85% of HLCM's interconsultas or referral appointments.

These basic health centers or consultorios are brightly colored, 2-3 story buildings that vary in capacity and size, and that are integrated into the neighborhoods they serve. Inside, they usually have a large waiting room for patients and families, a main desk where patients check-in, and then individual rooms distributed around the perimeter of the facility where patients can be seen by clinicians (nurses or doctors). Offices for administrators, vaccination, social work, and infant care (free distribution of newborn supplies for qualifying mothers) typically occupy the second level. The volume of

patients, and particularly pediatric patients, varies by facility size with some seeing a hundred or more patients per day (and at least a few dozen pediatric patients) while others a few dozen (with only a few pediatric visits). Patients are seen weekdays, with most seen in the mornings starting around 8am with few left by closing in the afternoon around 4pm. Some but not all consultorios offer weekend and evening hours.

Per the HLCM and wider public sector policy, pediatric patient referrals occur in a fairly uniform fashion across the whole system, starting with a guardian bringing his or her child to their local consultorio for an appointment. After checking in, they wait until either a physician or nurse sees them. There, that clinician makes a preliminary diagnosis and assesses the urgency of the health condition. If the patient requires urgent care, the patient is sent directly to a pediatric emergency department at HLCM or elsewhere. If not urgent but still requires advanced diagnostic evaluation or treatment patients are sent to a scheduling area in that same consultorio where a scheduler or health center administrator begins the referral process. There, the patient is either immediately scheduled for an appointment at HLCM or contacted later with their appointment information.

Pediatric appointment scheduling in this setting occur within the structure set by the health system, and in particular, they follow the referral policies described above set by Hospital Luis Calvo Mackenna (HLCM). The overarching study enrolled participants at the beginning of this process in the consultorios. Since the staff at these consultorios are the typically the only contacts patients and their families have with the health system

until their appointment at HLCM, staff participants were also recruited from the same 16 consultorios (from 6 communities) where we enrolled patients.

Research Design

This section presents the overall methodological approach and specific data collection and analysis methods used in this applied research project. After describing the conceptual framework, the methodological approach is explained. From there, the research design is presented, focusing on participant selection, data collection and analysis, as well as on issues of validity. Limitations of this study are are presented following the study conclusions and applied practice recommendations for this setting.

Conceptual Framework

Conceptual frameworks are a key component of research methodology as they inform the design and implementation of the research process and guide the development of the research process and analysis of the data collected (Ravitch & Riggan, 2011). The overarching conceptual framework of this study, the Health Belief Model (HBM) hypothesizes that the likelihood of attendance is determined by an interaction between patient and guardian characteristics, cues to attend appointments, guardian/patient health beliefs, guardian health status perceptions (seriousness and susceptibility) and guardian/patient assessments (barriers vs. benefits and perceived threat regarding a current or potential illness). As the overarching study's framework, the HBM was applied to the preceding quantitative studies and to this qualitative study to guide instrument development, as well as data analysis. For example, in-depth, semi-structured interview

questions were designed to address the themes and practices identified above as important in the HBM framework. Similarly, framework analysis, the approach used to analyze this study's data, drew from central understandings of patient attendance put forward by this framework, such as the importance of barriers in decreasing the likelihood of appointment attendance, in its coding and thematic analysis processes.

Though not originally in the conceptual framework, Lipsky's (1979) concept of "street level bureaucrats" became an important guiding concept in this study during the iterative analysis phase when the influence of staff members in determining attendance practices, and the existence of parallel and unofficial referral and reminder systems across consultorios arose from the data. Together, key concepts from the HBM, and Lipsky's argument regarding the influence of "street level bureaucrats" on large governmental systems combined to frame both large healthcare system interactions, as well as to the agency of specific, diverse local actors within the larger health system.

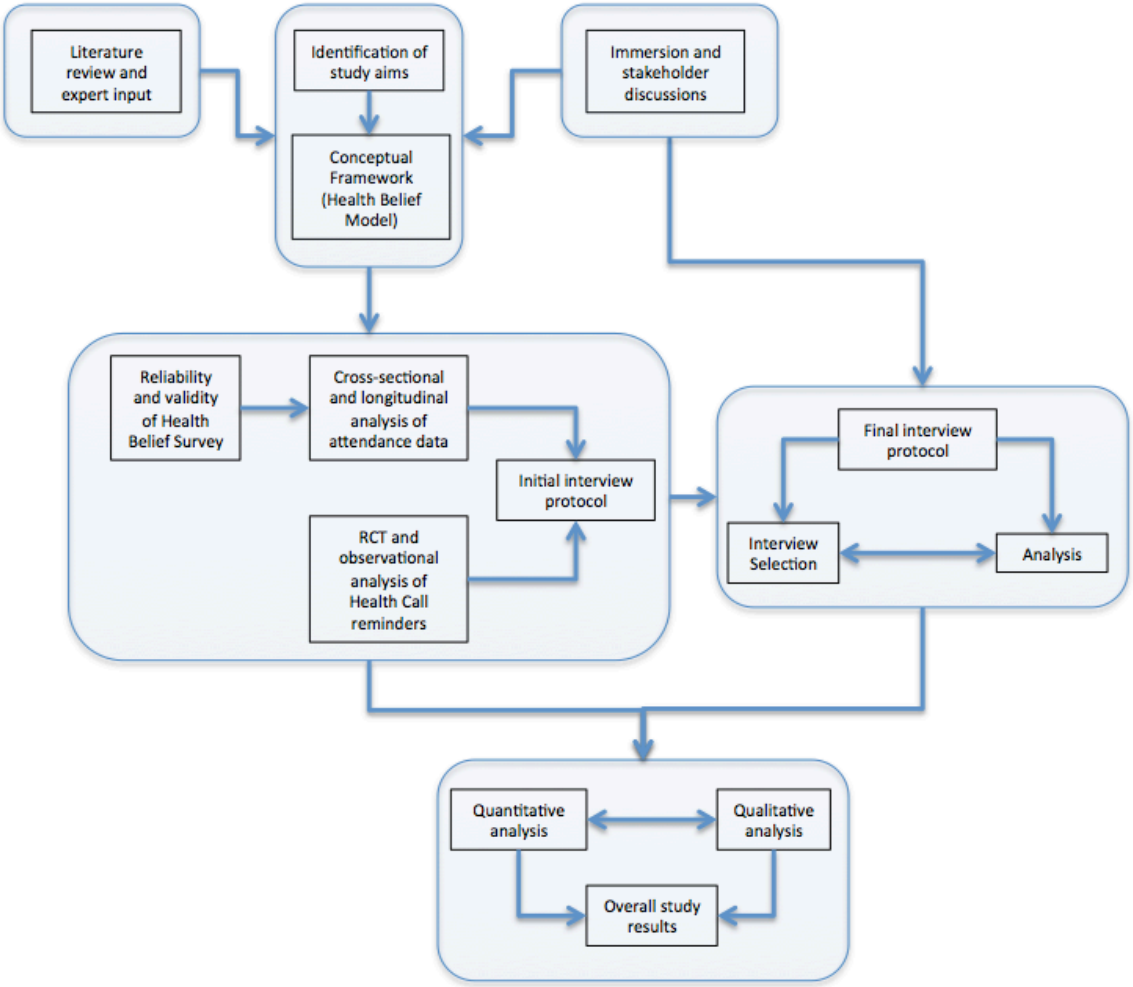
Methodology

This study employs applied research methodology. Applied research draws on "the problems and concerns experienced by people and articulated by policymakers" and seeks to "contribute knowledge that will help people understand the nature of a problem in order to intervene, thereby allowing human beings to more effectively control their environment" (Morse & Mitcham, 2002; Patton, 2002). Results from applied research are intended to develop understandings of social problems and identify potential solutions within a specific context. While results are intended to primarily understand pediatric

patient attendance at HLCM and existing interventions, this study also incorporates aspects of formative evaluation, which focuses on "improving a specific program, policy, group of staff (in a personnel evaluation), or product" since ideas for improvements of an existing interventions, Health Call, were also solicited (Patton, 2002).

Since a somewhat mature understanding of the issues being studied was available from the literature review, conversations with key stakeholders, implementation of the quantitative studies, and from several years of field observations, this information was used to inform the "scaffolding" for the analysis although was not directly analyzed. Within an applied research approach, investigators can use existing data as an initial scaffold around which new data can be analyzed. As analysis progresses and themes become clear, new ideas can emerge and replace or challenge the initial framework(Morse & Mitcham, 2002). The extensive literature available on patient attendance, on HBM framework and on reminder systems, as well as observation field notes during data collection and preliminary results from the preceding analyses, were all used as the scaffolding for the applied research analysis of experiences with patient attendance and reminder systems. The phases of study development are depicted in Figure 6.1.

Figure 6.1: Research Design



Adapted from: (Friedman & Wyatt, 2005; Kaplan, 1997; Yusof, Kuljis, Papazafeiropoulou, & Stergioulas, 2008).

In this study, the methodological aims focused on understanding experiences, decision-making, and values related to pediatric patient attendance(Creswell, 2007; Wilder & Gordon, 2009). A second aim was to explore how attendance could be improved through 1) understanding the impact of existing interventions like the Health Call system and 2) identifying new strategies to improve attendance. Finally, these results were intended to

provide context which could be integrated into the quantitative investigations of the overarching study(Lewin et al., 2009; Rapport et al., 2013).

Methods

To carry out applied research on this issue, and given the large amount of data collected by the quantitative studies on this topic that took place in tandem with this qualitative one, this study focused on carrying out in-depth open-ended (semi-structured) interviews with both staff and patients' guardians. Semi-structure interviews are characterized by open-ended questions that encourage participants to describe a particular topic in detail while allowing for space to discuss emergent and related themes(Patton, 2002). Field observations, which took place over two years (2012-2014) also helped to inform the interview topics and structure. These methods are detailed in greater depths in sections below. Development of Open-ended Interview Guides

Both guardian and staff were interviewed as part of this study. Since guardian participants had already enrolled in the overarching study and consented to be potentially contacted for a future interview, no additional demographic identifiers were collected although some information was used to identify the participant before starting the interview. Interview questions and prompts were directed at exploring specific aspects of the HBM (severity, susceptibility, barriers, benefits, and health motivations), as well as at understanding the attendance decision-making process. In order to identify key aspects of the decision-making process, interviews asked guardians to reflect on appointments that they attended, as well as on those they did not attend. In the final section of the open-ended interview instrument (**Appendix 6.1**), opinions of the Health Call system were

explored, along with perspectives on other potential interventions that may be useful in reducing missed appointments.

The staff interview guide (**Appendix 6.2**) focused on understanding staff attitudes around patient attendance and intervention adoption. It collected basic demographic information including their name, age, gender, community where they live, and the highest level of education they've completed, perceptions of and beliefs on reasons for appointment attendance, and how they understood their roles in relation to patient behaviors. The instrument was also designed to capture opinions about ongoing interventions to improve attendance and elicit new ideas for improving attendance.

The interview protocols were designed so that each interview would take between forty minutes to an hour. The interview guide was translated from English to Spanish and back translated to ensure clarity and accuracy. Pilot testing with two staff members and three guardians was conducted in March, 2014. The results from this pilot study contributed to improving the interview questions, identify areas that were confusing, dropping uninformative areas of inquiry, and improving the interview administration and recording process. Following piloting and improvement of this instrument, all of the semi-structured interviews of guardians and staff were carried out between April and September 2014.

Sampling Strategy

Criterion sampling was used to select guardian participants. In Criterion sampling, cases that meet a predetermined set of criteria are selected for interview. This approach is particularly suitable for evaluation since it selects informants that are likely to reveal program-relevant information (Patton, 2002). In this study, information was sought on patient attendance decision-making and reminder systems so selecting a sample where participants had topical knowledge but could also offer negative cases was important for establishing validity(Morse, Barrett, Mayan, Olson, & Spiers, 2002). Accordingly, initial interview criteria focused on sampling participants from the intervention group who had attended their appointment and another group who had not attended. These criteria were intended to elicit different types of decision-making criteria and develop an understanding of intervention exposure. However, trial implementation, review of past attendance and intervention data, investigator observations, and conversations with guardians and staff over the four years prior to data collection and during implementation of the preceding RCT indicated that virtually all participants had both missed and attended appointments and most guardians had been exposed to some sort of intervention to improve attendance (whether in-person counseling, manual calls from staff or an automated call from the Health Call system). Further, patients who miss two appointments are automatically dropped from the referral system for that clinical indication making those participants even less common to have existing or future referral appointments.

Using these new sources of data about the participants and implementation context, we

were able to focus the selection criteria once the interview phase started. Here, instead of selecting extreme cases who had either missed all their visits or attended all their visits or narrowing the criteria to specific areas like demographic characteristics or health beliefs that were being explored in other parts of the overarching study, we instead targeted participants who could, by serving as their own negative case, reflect on both attended and not attended appointments. By surveying those already consented to participate in the study, we could ensure the corresponding participant had had experience with referral appointments in the past and had missed and attended appointment. This also gave us richer background data on patient and guardian characteristics, prior attendance, and for some guardians, health beliefs.

We refined our guardian sampling criteria to select consented guardians whose corresponding pediatric patient had both attended and missed appointments in the past. These participants were then asked to reflect on both attended and missed visits. Additionally, since exposure to these interventions was essentially ubiquitous, participants were asked about their experiences with these interventions and ideas for improvement providing a potentially richer set of opinions about the intervention compared with only those who had received one intervention. Further, to improve participant recall regarding decision-making and their experiences with the various interventions, those with the most recent appointment were prioritized. A spreadsheet of study participants was created and sorted according to most recent completed study visit. Those who had had the most recent appointment as of April, 2014 were called first by the study interviewer, Alicia Rusoja (AR), who reminded them of the study goals, performed

a second brief consent process, and then carried out the interview. We proceeded down this list until data collection was complete.

For staff, a combination of Intensity and Snowball sampling were used. According to Patton (2002) Intensity sampling is where participants are selected based on their ability to speak with considerable depth on the phenomenon being studied. This type of sampling is particularly useful in program evaluation since, as opposed to extreme case sampling, they offer views that are not so divergent that they can be immediately discredited by readers but heterogeneous and deep enough to provide useful information for improving programming. Snowball sampling on the other hand uses interviewee responses to identify key informants(Yusof et al., 2008). Here, participants help inform the investigator team of which future participants could provide details that are relevant to the interview question and overall study goals.

Prior to selection of initial staff participants, I conducted individual and group meetings with leadership teams (director, assistant director, and administrator), schedulers, and clinicians from every consultorio participating in the study as well as the regional medical directors for each community, and the director of HLCM and HLCM staff. These meetings were focused both on trial logistics and understanding the key stakeholders in the referral process. These contacts revealed that consultorio schedulers and administrators control most of the referral process, and typically are the only ones in contact with guardians before they actually attend their appointments. As I conducted these meetings and my regular visits to all the study consultorios as part of the

monitoring process for the overarching study, many staff members requested to be interviewees. Accordingly, I collected their contact information for use once the interview phase started.

The schedulers and administrators identified as key informants through this process were then contacted in-person or via phone to comprise the initial focus of the study (Intensity sampling). To ensure coverage of all relevant staff, an email was also sent to all consultorio directors, administrators, and staff. The email detailed the objectives of the study and requested that participants either fill out a contact form or contact me via email to schedule an interview. Interviews were then conducted in-person whenever possible although phone interviews or written responses were also collected.

Over the course of the interviews, participants began to indicate that other staff including clinicians, facility directors, and social workers also impact the attendance process and may have relevant perspectives so several interviews were conducted with these participants as well (Snowball sampling). These participants were recruited, consented, and interviewed in the same way as the initial Intensity sample. One deviation from this sampling approach did occur a staff member from HLCM (Providencia) requested to participate in writing and have their responses included in the study, so their input was incorporated.

Data saturation is typically the standard for determining sample size in qualitative research although it can be difficult to assess in practice (Guest, MacQueen, & Namey,

2011; Morse, 2000; Yusof et al., 2008). In this study, ongoing discussion between AR and I before and between interviews, the generation of a few brief analytic memos, and several reviews of existing data were used to evaluate saturation. In the case of guardians, saturation was sought with regard to understanding the overall structure, general process, and general types of factors that contributed to attendance decision-making. For staff, saturation focused on understanding the different types of scheduling processes and some representative examples of interventions designed to improve attendance along with ideas for improving attendance. Perceptions of patient attendance decision-making were also collected although achieving saturation on this topic was not a primary goal of staff interviews. Results from initial interviews were used to guide subsequent recruitment of clinicians and other administrators.

However, due to geographical, study budget, time constraints, and participant schedules, interview were also sometimes conducted via phone or email. At health centers, interviews were conducted in a private room separated as much as possible from other staff members, at a time acceptable to the participant. Phone interviews were similarly arranged around participant schedules and confidentiality emphasized (such as taking the phone call from a private room).

Data Collection

This qualitative investigation took place between April and September, 2014, which was just over halfway through the data collection period for the parallel quantitative arms. While, as a US born male graduate student, I had spent an average of 1-3 months per year

in Chile including two-years of nearly continuous residence in Chile between mid-2013 and mid-2015, I recognized that native Spanish proficiency would likely improve the depth and quality of the interviews. Accordingly, all interviews were conducted by AR, a female native Spanish speaker of Chilean origin with prior research and evaluation experience in Nicaragua and with Latinx populations in the United States. All interviews were audio recorded for accuracy and then transcribed by either AR or a trained Chilean bilingual research assistant. For staff that responded via email, typed responses were analyzed in the same manner as the rest of the interview transcripts and content was comparable in length to oral interviews. The original Spanish transcripts were used during analysis to avoid changes in meaning that could occur during translation; exemplary quotes were translated into English for inclusion in this manuscript.

Participants for this study had been recruited from the 16 consultorios (from 6 communities) that participated in the overarching study. All interviewed guardians (N=12) were female, most were the patient's parent (N=10), and most came from Penalolen (N=9) although Providencia, Macul, and Nunoa each had one participant. The highest level of schooling achieved for most participants was primary or secondary (N=7) although several had started higher education (N=5). In terms of employment, participants were divided amongst full time (N=3), part time (N=2), unemployed (N=5), and home-makers (N=2). Patient FONASA Group A (N=6), Group B (N=3), Group C (N=1) and Group D (N=2) were represented. Of the 36 initially chosen for interviews, 13 had incorrect contact information, 2 did not answer, 9 were interested but saturation was

achieved before they were scheduled for an interview, and the rest made up the 12 study participants who were interviewed over the phone.

Staff participants (N=12) were mainly female (N=7) with ages ranging from 26 to 68. Penalolen, (N=3), Nunoa (N=3), Lo Barnechea (N=3), La Reina (N=2) and HLCM in Providencia (N=1) were represented in the sample. Participants mostly reported having started some primary or secondary school (N=2) or technical school or college (N=7) although several had completed medical school (N=3). Schedulers (N=3), psychologists (N=3), health center administrators (N=2), physicians (N=2), consultorio director (N=1), and social workers (N=1) comprised the job descriptions of the participants (**Appendix 3**). Of the 42 staff contacted, 28 did not respond, 2 were interested but saturation was reached before they were interviewed with the remainder interviewed for the study in-person (5), over the phone (3), or via email (4).

Data Analysis

The HBM, an extensive literature review of patient attendance and interventions to improve attendance, and preliminary results from the quantitative studies were used as scaffolding for analysis. This approach was selected since these data sources offered both context relevant details on the issues being studied and reflected existing paradigms for understanding patient attendance and reminder systems.

Objectives

Data analysis sought to directly develop a general understanding of patient attendance

and practical lessons for improving attendance. Specifically, data analysis had three main objectives: 1) to understand the factors, processes, actors, and values that impact patient attendance; 2) to capture existing ways health system staff are currently working to improve patient attendance; and 3) to identify new opportunities for improving attendance. Analysis prioritized these objectives although also left open the potential for lessons learned in relation to other alternative concepts of patient attendance, challenges to existing theory, and providing context, as results were established, to the preceding studies.

Framework analysis

Framework analysis was used to guide data analysis. This approach is particularly useful for applied research studies, like this investigation, that have specific questions, a priori hypotheses and foci, and a pre-defined sample(Rodrigues et al., 2015; Srivastava & Thomson, 2009). Our analysis mirrored the five stages of this approach.

In the first stage of framework analysis, the investigator familiarizes themselves with the data through review of transcripts and generation of analytic memos. Starting from the pilot interviews, interview content was reviewed by AR and ER and additional prompts or questions were discussed and incorporated into subsequent interviews. Analytical memos were used to record significant initial findings and relevant external circumstances or conditions. In the second stage of framework analysis, identifying a thematic framework, original and emergent codes are compared and revised to reflect the data. Patton (2002) notes that many studies move in between these deductive and

inductive approaches. Original categories from the HBM (i.e. Susceptibility) and sub-categories (i.e. Health importance; Taking illness seriously; Thinking about health; Illness is concerning) were created and included in the preliminary codebook.

The third stage, indexing, is where the investigator applies codes to the text. Here, coding started once preliminary review of the data by AR and ER began to suggest answers were beginning to become redundant. While some studies employ multiple coders which can potentially making coding more replicable, having more than one coder can also reduce the depth and insight of qualitative results(Morse, 1997). In this study, since ER had several years of experience through direct observation and development of the overall study, ER developed the initial codebook and performed the coding, while AP, who conducted the interviews and is bilingual, approved the accuracy of the transcripts and reviewed each phase of the analysis. There was no specific order, so analysis of guardian and staff interviews was interspersed along the course of the initial analysis. The Atlas.ti program Version 1.0.36 (Berlin, Germany) was used to code and review the interview data and analytical memos.

Codes, relationships, and definitions were continually revised throughout the coding process to account for themes that emerged from the data. This was particularly appropriate since, although the study started with a priori hypotheses (see scaffolding above) and structured topics for discussion, it became clear during the interviews that some of the emerging themes challenged the existing literature and hypotheses. As new categories (i.e. Attendance Decision Making) and sub-categories (i.e. Changing health

status, Family problems, appointment quality, etc.) were developed, they were compared with the existing codes leading to revisions in codes, larger themes, and conceptual connections. Exemplary cases and quotes were also connected to codes that rose from the data. At the end of the first round of coding, ER and AR rechecked the coding structure with the purpose of improving code descriptions and phrasing, as well as to confirm that codes were applied correctly. The entire interview dataset was again reviewed to check fit with the final codebook (**Appendix 6.4**). These final two steps of framework analysis, charting and mapping and interpretation, targeted the key areas identified in the study objectives (**Appendix 6.5**).

Reliability and Validity

We took several steps to address the reliability and validity or what others have called credibility, transferability, dependability, confirmability of the study (Golafshani, 2003; Lincoln & Guba, 1985; Morse et al., 2002; Shenton, 2004). Credibility is the match between findings and reality. Our first step was to perform an extensive literature review on both patient attendance and interventions to improve attendance as well as model our research approach on prior qualitative studies in particular work by Flynn et al. In their study, the authors used both prior survey data and semi-structured interviews from multiple sites to investigate patient and staff opinions of a new appointment scheduling system and explore ideas for new interventions around appointment attendance and scheduling(Flynn, Gregory, Makki, & Gabbay, 2009). To improve familiarity with the context, I made multiple trips to Chile to meet with key informants between 2009 and 2013 then spent 3-5 days per week in the study consultorios between 2013-2015. In this

study we used multiple sources of data (the analyzed interviews plus prior longitudinal observations and discussions, and attendance data), multiple types of key informants (staff and guardians), and multiple sites (multiple consultorios) to triangulate our results.

To improve honesty of informants, we emphasized our independence from the health system, consultorio, telecom company, and HLCM both in written and in verbal form prior to, during, and after the interview as well as conducted interviews in a private setting or over the phone attempted to improve confidentiality. Since participants served as their own negative cases, we built in the exploration of contradictory themes into the questionnaire by asking them about their own decisions to attend or not attend their appointments; an approach that was informed by Bai et al.'s study of breastfeeding decision-making (Bai, Middlestadt, Joanne Peng, & Fly, 2009). Combined with rephrasing, summarizing, and formal and informal iterative questioning, these strategies helped to ensure participants responses were being accurately understood and recorded. Since I was present for all the interviews, AR and I met after each every interview to debrief.

Transferability is the ability to convey enough information through the description of the research context to allow for the reader to decide the relevance of the study results for their own setting. Explicit descriptions of the context, study participants, methods, interviews, and time period were used to help readers interpret the transferability of this study to other contexts. Additionally, the literature review and results from the overarching study may provide useful information on the wider study context.

Dependability, which shares some conceptual relationship with credibility, is the stability of the methods over time. To improve dependability, we kept a log of the previous iterations of the interview approach, protocol, and questionnaire from initial to final version and notes, in conversation with the principal investigator, of the evolving study context and subsequent changes in protocol. Finally, confirmability reflects the objectivity of the investigative approach and analysis. At study outset, we acknowledge the theoretical underpinnings and the phases at which they influenced study design and analysis. Further, we incorporated multiple key informants and area experts both within and outside the health system to develop the protocol and codebook with continued input as these evolved in response to the context and study data. In the analysis phase, I analyzed the data independently although AR, who conducted the interviews, closely read the results. Several representatives from the original key stakeholder reviewed the final results. These processes, along with the protocol above, were also tracked.

Results

This study assessed the current referral system by seeking to understand how parents and staff experience the pediatric patient attendance system and by analyzing the relationship of these perspectives to existing theories on this issue. The study also sought to elucidate stakeholder perceptions of both potential and existing methods to improve patient attendance. Several themes emerged around appointment attendance, attendance decision-making, and reducing the number of missed appointments. Results are enumerated and explored below according to these themes.

Result 1: Care as a Commodity: Conflicting views on the value of appointments

With few specialist providers, short appointments, and many patients vying for visits, appointments can be viewed as a commodity, although one that guardians and staff valued differently. Both guardians and staff shared a strong dedication to improving patient health and, as a whole, a belief that the medical system could produce improvements in health. However, different conceptions of appointment value frequently resulted in actions that reduced potential patient health benefits.

Staff had specific expectations of why guardians should value appointments

In reflecting on why patients might not attend their appointments, staff had specific expectations of what guardians should value about their appointments. These were largely framed in terms of facility or health system impact of missed appointments. A particularly strong sentiment amongst staff was that patients, despite paying for public care with their taxes, considered public facility appointments to have "zero" value.

No penalty, that's why we have so many missed appointments, there are no penalties whatsoever for a person who misses [an appointment].

For these respondents, the appointment value was seated in a strong feeling that anyone receiving a referral appointment had a health problem that should be assessed or treated by attending the follow up appointment. Once that appointment was received, the

patient's guardian had a clear obligation to attend or notify the health system in advance they could not attend, regardless of other extenuating or emergent circumstances.

Even when respondents mentioned competing priorities such as inflexible or variable jobs, the expense of traveling to HLCM, or the opportunity cost faced by families attending appointments, these factors were superseded by what were perceived as larger responsibilities to the health of the patient and the health system whereby by not wasting appointment slots, health needs of other patients waiting for specialist appointments could be addressed.

In general, it has to do with the health of the child, in the sense that if the person [guardian] does not go the person harmed is the child…[we have to] explain what that means for the public system, but people don't care, we urge people that they have to look at it in terms of health, to maintain their health and treatments

Staff tended to see missed visits as wasting the opportunities for other patients to receive care. This message of guardian responsibility for the health of their own child and, indirectly for the health of other sick children, was sometimes implicitly or explicitly part of communications with families. Given these expectations, staff were frustrated by the perceived wasting of precious care. For them, missed appointments represented a pervasive failure of decision-making by the parent and abuse of the larger health system by patients (and their families) in general.

They think that if they come here complaining that they [the staff] are going to assign them another appointment. A little bit of laziness, they don't consider the effort it takes to assign another appointment, [its] a lack of culture.

Where better attendance was widely considered by staff to have no impact on the operation of health facilities, frustration with missed visits had the direct personal and professional implications for staff. Staff invested considerable amounts of time each day both within and outside of their normal responsibilities to (re)schedule appointments, provide families with information about the location and purpose of their appointment, and remind patients about upcoming visits by phone or even in-person. Facing a daily stream of patients requesting new referral appointments and a long list of patients whose health was presumably worsening as they waited for a visit, staff often invoked a deep seated responsibility for improving attendance. At the same time, there was a keen sense of powerlessness to change the beliefs and thus influence attendance decisions.

<u>Multiple, evolving forces impacted why families decided to attend appointments</u>

Guardians saw referral appointments as able to effectively provide curative care. Further, in contrast to the scarce system resources emphasized by staff, guardians valued family resources. Time, particularly in relation to their child's health, was a key resource around which guardians organized attendance decision-making. Appointment value was largely determined by an interaction between current health status, and anticipated future health as a function of the amount of time they would have to wait for the appointment.

The care is good at the hospital, I brought him there when he was hospitalized as a baby, delays occur with urgent care as well, the care is bad in terms of time, they take a long time so one has to take their child to a private clinic, one can't wait 5 or 6 months.

Others perceived health problems diagnosed as acute to be prioritized, either with faster referral appointments or emergency care at HLCM but, for the remaining diagnoses that were not acute, patients often experienced wait times that could extend for months or years. Whether this wait was acceptable or not to guardians was determined in part by perceptions of the information they received from providers at the consultorio, day-to-day experience of their child's suffering, and their perceptions of their child's health status. While attending appointments was a lower priority for children who were perceived as getting better or with unnecessary reasons for appointments, increasing severity did not always correlate with increasing appointment attendance, at least not in the public sector.

If I could pay, I wouldn't be here.

More costly private sector appointments were considered by respondents to be faster, longer in duration, more effective, and staffed by motivated, better educated physicians than public sector counterparts at consultorios or hospitals.

I don't know. I would not know, because if one does not have money they don't provide good service, and if one is from the lower class or lowest class, they also leave you

waiting. The give only paracetamol to the people no more, nothing more. This same thing has happened to me here with the big ones [big kids], only paracetamol.

Many respondents expressed that free public care was not always worthwhile given that attending appointments in the public sector came with many hidden costs. Where those with flexible schedules were able to attend their appointments easily, others had to skip work, spend long hours on public transit or money on taxis, and/or travel at early hours of the morning to attend an appointment with their child.

When I go to get an appointment for my son I always go at 5:30 in the morning, to the health center, but there's a lot…its dangerous.

Referral appointments were often scheduled in the morning meaning patients had to take very full subways, buses or cabs to the health facilities. Block scheduling added an extra degree of uncertainty in requiring patients to show up at a specific time but potentially wait for an extended period of time. Forgetting appointment visits was sometimes an issue, with many appreciating the appointment reminders they received.

One time my daughter was to be seen by the hospital gynecologist, I arrived on time at the hospital and the doctor wasn't there and they had not let me know, I got there and they had changed the appointment time, they didn't tell me they had changed the time.

Result 2: Street Level Bureaucracy: Front line workers, far reaching impact

The privileged position of a small number of non-clinician administrators at the community level within the larger, ostensibly inflexible referral system allowed them to exert significant influence on appointment allocation. Staff beliefs about who deserved appointments—a reflection of clinical severity and judgment of family values—to control the allocation of central and consultorio level health system resources.

Lipsky's concept of "Street-level Bureaucracy" contends that administrators at high-capacity, low-resource facilities exert significant influence on policy enactment, and accordingly health outcomes. It also argues that, in order to cope with the stress of their position and difference between ideal and actual system function, staff in these positions develop prejudicial, simplified, inaccurate attitudes toward users. A combination of their values and influence result in the enactment of heterogeneous alternative policies throughout the health system. These conceptions are a useful framework for understanding the key actors, values, and informal systems that controlled HLCM's referral appointments (Lipsky, 1979, 2010).

<u>Front line health workers controlled the allocation of care</u>

One of the most important ways local staff exerted control over the health system was by deciding how referral appointments were made. The standard referral process started with a visit to the local consultorio for an exam carried out typically by a physician but sometimes with a nurse. If this provider assesses that further specialist care or advanced diagnostics were needed, the consultorio would arrange a subsequent appointment for

tertiary care. In some consultorios, the clinical care providers, per official policy, decided all referral appointments during the initial clinical encounter. In others, a weekly panel made up of clinicians and consultorio administrators reviewed each potential referral to assess whether it warranted an appointment at HLCM. There, the staff members would weigh factors like priority and recent attendance before deciding to schedule an appointment at a referral center. At others, referrals for certain specialties were reviewed while others were not.

While the official policy strictly limited the formal input of non-clinician staff such as schedulers and health center administrators, their presence at these alternative referral processes was common and their input weighed into the referral process. This influence over the referral process was not restricted to group referral decisions; they also carried independent opinions of who deserved appointments and often intervened accordingly.

[For example, for each step of those cases that are most urgent, we call them…I called Calvo Mackenna and asked them to please let me take charge. I'm quite annoying. I bug them until I get to the person I need [to schedule the appointment].

Non-clinical staff opinions reflected an intersection between several important ideas. First, that appointments are a rare commodity. Second, that patients and their families shared a largely uniform, inappropriate set of values about appointments that differed from the correct values shared by staff and the health system. Third, staff asserted that patients are often missing their appointments and that these decisions reflect decision-

making that is based on faulty values. Finally, there was the clear opinion that staff should play a role in reducing missed appointments. These opinions framed the series of extra-policy actions taken throughout the health system to influence patient attendance.

Inequitable intervention

Intervening in "urgent" cases was one of the most common, ostensibly benign ways staff members used their own discretion to subvert the official, clinician-derived urgency level of the appointment and get certain patients appointments faster. Guardians could play a role in this process by going directly to HLCM to ask for an appointment however, in the rare instances this strategy was successful, it was because the guardian knew someone at HLCM. In most cases, non-clinical administrative staff performed their own assessments of patients and controlled access to further clinical evaluation.

Every level of staff triages patients, we filter which patient really need an appointment and which patient does not really need an appointment. Many patients come for exams…we know whether the exams are abnormal or whether in reality they are not.... We filter all [the patients] so that appointments are not lost or abused and can [be given] to a patient who requires the appointment, someone who in reality needs that timeslot.

This control extended to referral appointment as well. While sometimes cited "benign" reasons like being unable to contact a guardian, staff could independently cancel existing appointments at HLCM at their own discretion.

Result 3: Missing Information Reduced Intervention Impact

Most interventions throughout the health system focused on addressing human error after the appointment had been made rather than addressing household constraints at the time of scheduling, or those that developed during the waiting period. Ad hoc interventions developed at individual consultorios and systemic interventions like Health Call were limited both by their tacit assumptions and by incomplete implementation.

Point of care strategies

Patient oriented strategies represented an important way in which individual staffers concretely acknowledged guardian values in the scheduling process. While most appointments were booked in a standard way with the next available slot given to the patient, there was some variation by specialty and facility. In psychology, which has a high non-attendance rate, some schedulers booked appointments 24 to 48 hours ahead instead of weeks in advance which they perceived as reducing non-attendance. Acknowledging that many parents were unable to get time off, at one center the staff would encourage patients to request a permission slip from their specialist to give to their boss to excuse them from their job; other clinics utilized longer hours and or specifically attempted to schedule around other commitments.

Indeed, I might ask: "If I give you this timeslot, would it work for you? Will you go? Because if it doesn't make sense for you and if you're not going to go, we won't schedule this visit [at this time]."

According to guardians, the match between their constraints and availability of health system resources was an important determinant of attendance so these interventions likely have potential for success at a larger scale. However, most were implemented in isolation which diminishes the potential impact of the interventions had they been combined.

Informal patient education also occurred at many facilities. The messaging used by staff tended to reflect their own values with key messages focusing on explaining the referral system, importance and cost of the appointment to the system, and potential lost opportunity for other children created by a missed appointment. Staff acknowledged that these strategies were not always successful, either because they did not have enough time to contact families or because they believed guardians did not heed their advice. Discussions with guardians illustrated their understanding that the system was overwhelmed and many other children were waiting for appointments but this did not seem to impact attendance decision-making. This strategy of patient education around scarce resources appeared to be of limited value.

Interim contact

Most staff and guardians considered long wait times as the most important problem with the health system. Reminder systems were premised on two assumptions: first that wait times were so long that many guardians would forget their appointment or potentially no longer need it; and second, that by identifying appointments that won't be attended in advance, they could be allocated to other patients. The most common and preferred

mechanism for both staff and guardians was phone calls. Reminder calls were ideally made sometime during the week before the appointment. Consultorio schedulers or administrators were generally perceived as responsible for making these calls although this was not always explicitly included in their job descriptions. Guardians appreciated the personal touch of receiving a call and liked that it offered an opportunity to change or cancel an appointment.

I call to remind them. That's my job here. I do not know if it's my legal responsibility, but that's my job here.

Most staff expressed a desire to remind patients but often lacked protected time to spend on reminders so they often stayed past normal work hours to make calls or even perform home visits. The sheer volume of upcoming appointments at HLCM meant that staff had to select which patients to call and that their own expectations around reaching patients were rarely met. This process potentially contributed to further asymmetry in the allocation of health system resources and, as another area where staff did not meet their ideal goals, a potential impetus for the stereotypes described by Lipsky (Lipsky, 1979, 2010).

The Health Call system was implemented specifically with the objective of standardizing reminders while improving coverage. The system called guardians a week before their appointment to remind them about appointment details; they were also offered the option to cancel, in which case their information was passed on to HLCM administrators for subsequent rescheduling. Implementers hoped the human sounding interface and ability

to confirm, change or cancel an appointment would offer some of the personal touch preferred by guardians while still identifying patients who would not attend their appointments. The Health Call reminder system was perceived to be of mixed utility by guardians. Some perceived the calls as less personal and containing only information when more interaction was desired. For some, a human caller was preferred due to ease of use and interaction including rescheduling; others liked the automated reminders and were able to reschedule appointments.

Three or four days before one has an appointment they remind you that one has an appointment. They called me to change the time, they called me to see if I was going to a checkup…So that is good.

Health Call was seen overall as potentially beneficial but perhaps not an ideal strategy for everyone. An important concern for any automated intervention was ensuring correct data, particularly in light of potential long-term implications for when incorrect information is given.

[F]or a call like this like an automated call that is made I had an appointment scheduled suppose for the 3rd of October at 10am and I knew I had an appointment that day, and a few days before they called me to remind me of that appointment with the gynecologist yet they tell me that the info from the automated call was incorrect so that the next time they called me I did not know whether to believe the recorded message or not.

As a whole, these reminder interventions likely contributed to reducing the number of guardians who forgot their appointments but they lacked any tangible connection with reallocating available appointment slots to other patients. Most systems contacted patients within a few days of their appointment leaving little time to assign vacated spots to other patients. No staff respondents indicated they played a role in assigning open spots to waiting patients and no guardian indicated being contacted about these opportunities. Only one representative from HLCM was included in the sample, so it is possible that others involved in this process were simply not interviewed during the study. In either case, such short term is likely inadequate for rescheduling most appointments.

Missed Connections

Whether human or machine, the lack of accurate patient or guardian contact information and the lack of health system personnel to contact them were significant barriers to implementing most interventions at scale. Schedulers often spent a significant portion of their time trying to find patient addresses, phone numbers and contact information. If they couldn't find the information, some consultorios would send their staff to patient homes to deliver the reminder in-person, although this appeared to occur infrequently. For the Health Call system, any phone number that was incorrect in HLCM's system, which was the case for more than 80% of guardians, resulted in no reminder call being generated. However, reminders were effective in increasing attendance for the minority of patients that received them.

Discussion

This study sought to understand determinants of patient attendance and identify ways to improve attendance. Staff framed appointments as having a high, largely fixed value, which some families did not appreciate while for guardians, this value was fluid relative to constrained family resources, situational constraints, and alternative paths to better health. In the limited instances where value systems overlapped, strategies to reduce missed appointments were effective. In general, staff did not have enough time to communicate with the many patients with scheduled appointments and even when they did, their efforts often targeted values that were not shared with guardians, likely limiting the effectiveness of their interventions.

The results above show that there were competing views around attendance decision-making and therefore different ways to improve patient attendance. The assumption of health system policy was that appointments were allotted based on medical need and appointment availability. Further, this policy implied that when guardians receive an appointment, they are accepting a responsibility for patient health and stewardship of health system resources and that attending the follow up appointment fulfills these responsibilities. In this system, trained clinicians decided who needed referrals and administrators and schedulers organized referrals at HLCM.

In reality, non-clinician staff and guardians had significant influence on appointment scheduling and attendance. They shared beliefs regarding the importance of improving patient health and the rare nature of health system resources but had divergent

perspectives on who deserved appointments and how resources (health system resources for staff, household resources for guardians) should be allocated to achieve the best health outcomes.

Staff perspectives on attendance aligned with many factors in the conceptual framework, emphasizing the importance of severity, susceptibility, benefits, and, through reminder systems, cues to attend although downplaying the relative importance of patient, guardian, and household characteristics as well as barriers to attendance. Guardians emphasized that attendance was the result of a fluid interaction between evolving health status, available treatment options, household resources, and overarching constraints. These views were consistent with work by Lacy et al. in a primary care setting in the USA, who found that non-attendance at follow-up appointments was driven by feeling disrespected by the health system, particularly through a lack of compassion for patient schedules, opinions or symptom level and long-waits for and during follow-up appointments even for issues perceived as urgent(Lacy, Paulman, Reuter, & Lovejoy, 2004). As in this study, logistical issues such as transportation were mentioned but were not the key reasons patients did not attend, and the end result was a mismatch between needs and resources driven by differences between health system and guardian values.

While staff contended that changes in patient values and behaviors are the solution, evidence from their own practice and the health system as a whole show that efforts to influence guardian beliefs incur high costs without producing proportionate results. Perhaps the most important way the health system could address missed appointments is

by becoming more oriented toward household and patient needs. The goal of patient centered care is to, by understanding the patient and family experience of health care, design care and communication processes that better address the needs of patients (Barry & Edgman-Levitan, 2012; Gerteis, 1993). The key concepts include: respect for the patient's values, preferences, and expressed needs; coordinated and integrated care; clear, high-quality information and education for the patient and family; physical comfort, including pain management; emotional support and alleviation of fear and anxiety; involvement of family members and friends, as appropriate; continuity, including through care-site transitions; and access to care (Barry & Edgman-Levitan, 2012; Gerteis, 1993). These concepts have classically been applied to complex decision-making about invasive, dangerous, and/or long-term care management but are also relevant to understanding guardian decision-making.

In patient centered care, values and expectations are explicitly discussed and decision-making is shared, acknowledging that the choice preferred by the health system is not necessarily the best choice for an individual patient or their family. Later facility hours, setting referral appointments around guardian schedules, and other examples of potentially scale-able practices were found around the health system but were mostly outliers. The implementation of patient centered care, an approach with roots in pediatrics, is discussed widely elsewhere (Jackson et al., 2013) however, evidence for this models is primarily from in high-income, private-payer health systems. The applicability and appropriateness of patient centered care or other models will need to be explored in the Chilean context before being applied at scale.

Across the consultorios, non-clinician staff demonstrated a variety of practices that effectively controlled access to referral appointments. Operating between an overwhelmed health system and the many patients waiting for specialist appointments, these "Street Level Bureaucrats" were able to exert control over who received appointments, when they received them and which patients were deemed priority or had appointments that were no longer necessary (Lipsky, 1979, 2010).

In a system where official policy allocates appointments based on order of referral and clinical urgency, diverse practices allowed staff to ration appointments according to their own values. Consultorio staff do not regularly have access to HLCM attendance data, so any decisions, even had they been sanctioned by official policy, would have been made without knowledge of actual individual or aggregate attendance data. These characterizations and actions mirror Lipsky's assertion that many staff in similar contexts develop simplistic views about heterogeneous populations as a way to manage the disappointment that comes with not being able to sufficiently influence outcomes such as attendance (Lipsky, 1979, 2010). The end result of these strategies is a system where some patients are unknowingly penalized either through the omission of advocacy or the negation of established access.

Recommendations for improving attendance

Guardians and staff wanted more contact between patients and the health system and were open to new types of interventions. They emphasized that many interventions

required large investments of time or other resources and that these interventions, including Health Call, likely require considerable adaption to the context in order to reap dividends at scale (Flynn et al., 2009; Rodrigues et al., 2015; Walji & Zhang, 2008). Several key recommendations arose from this study and are presented below.

First, contact information needs to be improved. Both staff and machine-based interventions cannot deliver any messages to those they cannot contact; methods for improving contact are discussed elsewhere (Chapter 5). Second, interim contact should be made with guardians to help to identify those who may not need or be able to attend upcoming appointments; this would provide adequate notice for reallocating appointment spots to other patients. Third, the interventions already in use to improve attendance should be further studied and considered for wider use. Even focused, small-scale investigations could help capture the potential utility of these interventions at other health centers. Fourth, appropriate evaluation can likely support the improved implementation of technology at scale. Bovens and Zouridis's aptly named manuscript "From Street-Level to System-Level Bureaucracies: How Information and Communication Technology Is Transforming Administrative Discretion and Constitutional Control" points out that the growing use of technology in all bureaucracies and its extreme impartiality may also threaten system goals (Bovens & Zouridis, 2002). van Gemert-Pijnen et al. as well as the WHO's MAPS Toolkit offer useful frameworks for developing, implementing, and evaluating the technological interventions in health settings(van Gemert-Pijnen et al., 2011; World Health Organization, 2015).

Finally, efforts should be made to reduce the burden, whether policy or self-imposed, on staff. Lipsky contends that these stresses contribute significantly to the development of prejudicial views and, through their implantation, de facto policies that are inequitable (Lipsky, 2010). Whether or not this relationship holds true, staff throughout the health system are critical partners in system change. Any policies or interventions implemented to improve patient attendance must acknowledge the importance of the guardian and staff values that so clearly impact attendance decisions. Failure to meet guardian and staff needs will continue to leave guardians and staff frustrated, drive the use of unsanctioned strategies around the health system, and leave many children without the care they need.

Limitations

The study was not meant to be comprehensive or necessarily generalizable beyond the specific contexts and time periods in which it was conducted. Instead, it focused on understanding how those interviewed conceived of appointments and the ways in which different parts of the health system, both patients and providers, tried to accomplish their goals. Morse et al. outline several verification strategies for assessing the rigor of qualitative research including: methodological coherence, sampling sufficiency, ongoing analysis, thinking theoretically, and theory development.

Methodological coherence

While we initially had planned to do Grounded Theory, the fairly wide scope of the questions identified by local policymakers, emergence of specific results from the other trials, and the very limited budget for this study (<$5,000 USD) dictated a more focused

approach both in relation to addressing the practical questions raised about the overarching study's hypotheses and the specific results required.

In this study, applied research with a component of formative evaluation was used since the study goals sought to understand and improve health system practice. In order to maintain methodological coherence, an analytic approach using the HBM, prior literature, and preceding results as scaffolding for analysis was selected since these offered both context relevant details on the issues being studied and reflected existing paradigms for understanding patient attendance and reminder systems. In this study, several investigators reviewed the preliminary conceptual framework and general codes and while ER with input from AR developed the final codebook and performed the coding and analysis. Having more than one coder can improve reliability however, agreement does not imply accuracy, reliability or utility of results(Hruschka et al., 2004; Morse, 1997). ER's experience with the context and literature combined with input from AR enabled a deeper, contextually pertinent understanding of the results, the emergence of new codes, and ultimately new domains.

Sampling sufficiency

Participants were selected that could speak generally to the decision-making process and reminder systems. Since most patients had both attended and missed appointments, each participant was used as their own negative case. In most instances, guardians could speak to prior missed visits but some did not recall a prior missed appointment even if HLCM records indicated the patient in their care had missed appointments. Recall or social bias

may have played a role in participant responses conversely, it is possible that another guardian could have been involved with that decision as could have been the case for patients with shared custody. Missed appointments are a common experience but are less common than attended appointments (about 3/4ths-4/5ths of appointments are attended at HLCM). Accordingly, it is also possible that missed appointments were both less common and further in the past making recall more difficult. In either case, revisions in the interview approach or an extreme case sample could have improved the level of detail regarding missed appointments.

Given the study goals, multiple important perspectives were not heard or perhaps sufficiently weighted. For guardians, participants who could not be contacted were not interviewed. This group may have many important perspectives since the reasons someone isn't able to be contacted via phone may be related to their socio-economic status, education level, health system access, and many other factors which could be related to attendance. Interview with this group of unreachable participants may provide key information on ways to tailor appointments and interventions toward these important constituents in the future. Other key guardian perspectives may include those from other communities, other members of the household, and perhaps from those who have patients that have attended a lot of appointments or few appointments. For staff, HLCM schedulers and administrators as well as leaders from the regional/community health organizations or FONASA may also have useful details about the referral process.

Early versions of the study protocol included focus groups however, due to limited study funds and non-overlapping participant schedules, this method was unfortunately not included. Focus groups could have been one way to add greater validity to the results offering participants the opportunity to explore opinions and compare their perceptions to those of other participants but were not performed due to participant scheduling limitations and study budget constraints. Finally, it is possible that important implicit or explicit details were missed; quality and validity checks described above and collaboration with Chilean researchers should have helped to mitigate these shortcomings.

Ongoing analysis, thinking theoretically, and theory development

Continual discussion between ER and AR and generation of several brief analytical memos occurred during the course of data collection. This helped to guide the direction of questioning, relevant participants, and determine saturation but no formal concurrent analysis was undertaken during analysis. Investigator analysis during the study did however allow for thinking theoretically and theory development as ideas that emerged from the data were tested against new data and used to develop theories that challenged and replaced the a priori framework or hypotheses.

Conclusions

Patients and providers were deeply invested in improving access for pediatric patients to referral appointments, although they applied different value systems to follow up appointments. Human and automated reminder systems like Health Call could play an

important role in meeting the resources constraints of the health system while improving communication with guardians. However, considerable implementation gaps exist. Attendance interventions both here and historically have drawn from staff and health system value systems instead of guardian paradigms. Achieving improved attendance likely requires re-orientating of scheduling system so it is more patient and family centered.

Appendices

Appendix 6.1: Guardian Interview Form

1. Demographic information

Name: _____

RUT: |___|___|___|___|___|___|___|___|-|___|

Patient name:_____

Patient RUT: |___|___|___|___|___|___|___|___|-|___|

2. Recently attended appointment.

[Probes: *Key decision makers like mother and father and their relation to attendance, impact of the appointment on child's health, ease of attending, opinion of physician, clinic, and diagnosis or treatment process, seriousness of child's disease and concern about health, child's susceptibility to subsequent worse health or relapse, concern about opinion of providers, economic and logistical concerns.]*

2a. How many appointments have you attended, if any, at Hospital Luis Calvo Mackenna with this child/one of your children? [*If none, skip to 3]*

2b. What was the last appointment at Hospital Luis Calvo Mackenna you attended with your child/one of your children? Please you describe this process of getting this appointment with your child.

2c. How did you decide whether to bring your child to this appointment?

2d. Do you feel attending this appointment was the right decision? Why or why not?

2e. What has happened since this appointment with this health issue?

3. Recently missed appointment.

[Probes: *Key decision makers like mother and father and their relation to attendance, impact of the appointment on child's health, ease of attending, opinion of physician, clinic, and diagnosis or treatment process, seriousness of child's disease and concern about health, child's susceptibility to subsequent worse health or relapse, concern about opinion of providers, economic and logistical concerns.]*

3a. When was the last scheduled appointment at Hospital Luis Calvo Mackenna that your child DID NOT attend? Please you describe this process of getting this appointment with your child.

3b. How did you decide not to bring your child to this appointment?

3c. Do you feel not attending this appointment was the right decision? Why or why not?

3d. What has happened since this missed appointment with this health issue?

3e. In what ways are regular appointments at consultorios similar or different from these follow up appointments at Hospital Luis Calvo Mackenna? How does this affect your decision to go to these appointments?

4. Improving Attendance

[*Probe: scheduling, reminder systems (email, text, phone, mail, etc), logistics, relationship with provider, etc*.]

4a. What do you think would help patients attend more of their appointments?

4b. What do you think are some of the major problems with healthcare in Chile?

4c. What could be done to improve these issues?

4d. Do you think text messages, email, automated phone calls, or phone calls from staff, amongst others, could help improve patient attendance? Why or why not?

5. Reminder Call

5a. Did you receive the reminder call? [*If none received, skip remainder of section and finish interview]*

5b. What was your experience with the reminder call?

[Probe: Likes, dislikes, issues in understanding, perceptions of interactions with the system]

5c. What difference did the call make, if any in attending the appointment?

[Probe: Which aspects about the call are helpful, which less helpful]

5d. What would you change or improve about the reminder system?

[Probe: Message, timing, privacy, interface, voice, etc.]

6. Wrap up

6a. Is there anything else you'd like to tell us?

6b. Do you have any questions for us?

Appendix 6.2: Staff Interview Form

Demographic information

Name: _____

Age:_____ Gender: Male /Female [Circle one]

Community of residence:_____

Name and location of workplace: :_____

Highest level of education completed:_____

1. Staff information

[Probes: *Facility, position, department, time working at facility, previous positions, interaction with patients]*

1a. Please describe your position and day to day activities in this position.

1b. Briefly describe where have you worked previously and for how long.

1c. Can you please describe how patients are scheduled for appointments here?

2. Opinions about attendance.

[Probes: *Key decision makers like mother and father and their relation to attendance, impact of the appointment on child's health, ease of attending, opinion of physician, clinic, and diagnosis or treatment process, seriousness of child's disease and concern about health, child's susceptibility to subsequent worse health or relapse, concern about opinion of providers, economic and logistical concerns.]*

2a. What happens when a patient doesn't attend their appointment here?

2b. How do miss appointments impact your work? How do they impact this consultorio/hospital in general?

2c. Why do you think patients don't attend their appointments at consultorios? Why do you think they do not attend their appointments at HLCM?

2d. Do you feel that you are able to influence whether patients attend their appointments? In what way? How much time do you spend on activities related to patient attendance per week?

2e. What are some of the benefits for patients if they attend their appointment? What are the costs and/or disadvantages of attending their appointment?

3. Improving Attendance

[*Probe: scheduling, reminder systems (email, text, phone, mail, etc), logistics, relationship with provider, etc*.]

3a. What do you think would help patients attend more of their appointments? Why?

3b. Who should be responsible for implementing these ideas? Why?

3c. What do you think would be the positive resultos of more patients attending their appointments?

3d. What do you think would be the negative results of more patients attending their appointments?

3e. How do you think staff behaviors would change in response to a larger number of patients? Why?

3f. Do you see any ways in which text messages, email, automated phone calls, or phone calls from staff, amongst others, could help improve patient attendance? Why or why not?

4. Wrap up

4a. Is there anything else you would like to tell us?

4b. Do you have any questions for us?

Appendix 6.3: Participant Characteristics

Table 6.3.1. Guardian Characteristics	
Gender	
Male	0
Female	12
Relationship with Patient	
Other Guardian	2
Parent	10
Community at Enrollment	
La Reina	0
Penalolen	9
Providencia	1
Macul	1
Lo Barnechea	0
Nunoa	1
Highest Level Started	
Preschool or less	0
Primary or Secondary	7
Technical School or more	5
Marital Status	
Married or Co-habitating	6
Single or Widowed	5
Separated or Divorced	1
Occupation	
Full Time	3
Part Time	2
Unemployed	5
Home Maker	2
Patient FONASA	
Group A	6
Group B	3
Group C	1
Group D	2
Other	0

Table 6.3.2. Staff Characteristics	
Gender	
Male	5
Female	7
Age Range	26-68
Community	
La Reina	2
Penalolen	3
Providencia (HLCM)	1
Macul	0
Lo Barnechea	3
Nunoa	3
Highest Level Started	
Preschool or less	0
Primary or Secondary	2
Technical School or College	7
Medical School	3
Position	
Scheduler	3
Health Center Administrator	2
Psychologist	3
Consultorio Director	1
Physician	2
Social Worker	1

Appendix 6.4: Overview of Study Codebook

- Attendance decision-making
  - Advice / care will improve child's health
  - Appointment cost
  - Appointment quality
  - Appointment time
  - Attendance difficulty
  - Attended appointment(s)
  - Change(ed)/cancel(ed) appointments
  - Changing health status
  - Family problems
  - Forgot appointment
  - Health is important
  - Medication cost
  - Missed appointment(s)
  - Perception of patient
  - Perception of physician/doctor
  - Private sector
  - Safety
  - Satisfaction with care
  - Transportation
  - Value of care
  - Wait time or wait list
  - Work conflicts
- Communication
  - Hospital communication
  - In person
  - Misunderstanding
  - Patient communication
  - Patient education
  - Phone calls
  - Understand diagnosis
- Interventions
  - Appointment reminders
  - Email
  - Health Call
  - Home visits
  - Improving attendance
  - Missing information
  - Technology issues
  - Text messages / SMS
  - Whatsapp
- Outcomes
  - Facility or staff impact
  - Health system impact
  - Health system resource shortages
  - Patient impact
  - Public care improved health
  - Staff or physician shortages
- Referral Process
  - Acute illness
  - Chronic illness
  - Interdisciplinary meeting
  - Multiple health problems
  - Preventable illness or vaccination
  - Problems with scheduling
  - Scheduled or Pending Appointment(s)
  - Scheduling process
  - Severity
  - SIDRA/ Scheduling technology
  - Specialty type

Appendix 6.5: Framework Analysis

	Summary	Categories	Codes	Result
So, yes, a lot of them wait a long time for the appointments. There are people who spent years ... three years waiting for an appointment with a specialist.	Patients wait for a long time for care but do value their appointments	Attendance decision-making	Wait time or wait list	**Result 1.** Care as a Commodity: Conflicting views on the value of appointments
Very good decision, very good, because at least I no longer had a doubt about why my granddaughter had the problem. I am going to the second appointment because I need to see how the treatment has changed, to see if the skin is better or similar.		Attendance decision-making	Value of care	
There are some isolated cases, like I told you, where patients missed because they had a family problem, someone was sick, someone had to travel,... I mean, are these are absences when we didn't notify them but the rest, I don't know. I don't know what else can be done.	Patients weigh many factors in deciding on whether to attend an appointment.	Attendance decision-making	Family problems	
Yes, I at least always (attend), I have three children, I always trust the hospital, we always decide (to attend), the last operation we were going to do in the private sector where everything is fast but because you're paying outside (the public system) everything would be more expensive, so we did the operation in the hospital, his finger was spectacular (after the treatment), lots of confidence in the hospital (Hospital Luis Calvo Mackenna), I have a deep level of trust in the doctors there.		Attendance decision-making	Perception of physician/ doctor	
No, I have to go to schedule one because I missed an appointment, a matter of her school and testing. It wasn't ideal to take her out of school (for the appointment).		Attendance decision-making	Problems with scheduling	

Appendix 6.5: Framework Analysis (con'td)				
I find that it would be better to go straight to the hospital and there schedule an appointment. I know people in this consultorio, many people being seen and it is understaffed, the attention is good in some parts and in others very bad, very bad referral appointments, some have waited years for an appointment and then missed it because no one told them.	Administrators and schedulers can significantly influence the attention patients receive during the referral process.	Referral process	Problems with scheduling	**Result 2.** Street Level Bureaucracy: Front line workers, far reaching impact
When there are patients from this sector, close to the consultorio, I personally go to the patient's house and give the appointment time. But sometimes patients, for whatever reason, are not living there, or I don't know, aren't at their home, or they changed phone numbers so that's practically a lost appointment.		Communication	Patient communication	
What would help (improve patient attendance)? That they (staff) call to confirm and remind patients about their appointments. That would be good.	Missing information hampers efforts to communicate with patients.	Communication	Phone calls	**Result 3.** Missing Information Reduced Intervention Impact
But also those are for the staff who are going to remind the patients that they have an appointment tomorrow but there are many patients with whom you can't communicate, who give a bad phone number, or who's phone doesn't have reception.		Interventions	Missing information	
If at least we could work (send reminders) through text messages, that would be ideal.	New ideas for interventions considered vs. potential issues with older guardians or older patients.	Interventions	Text message/ SMS	
The elderly people do not know how to react to these calls. They believe they are calling from the hospital. Young people, no problem. Seniors do not handle email, Whatsapp, etc., do not use cell (phones). For younger patients, yes, they use emails, (text) messages, frequently. They would not have problems. 40 and below are more comfortable with technology, phone contact wouldn't be a problem.		Interventions	Whatsapp	

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Chapter 7: Conclusions

Study Findings

The objective of the research presented here was to understand patient attendance and whether a novel reminder system, Health Call, could reduce missed appointments at a tertiary pediatric care center in Santiago, Chile. The conceptual framework developed for this study was based on the Health Belief Model (HBM). It posits that perceptions and modifying factors, themselves influenced by cues like reminder calls, are processed through a series of assessments integrating these health beliefs and ultimately resulting in a health behavior decision such as attending or not attending an appointment. Given the complexity of attendance, multiple methods were used to examine determinants of attendance and attendance outcomes.

The psychometrics study (Chapter 3) tested a questionnaire based on the HBM with a group of guardians and found that the four-factor scale (Care Seeking, Illness Prevention, Parental Health Concerns, and Susceptibility) had acceptable reliability and validity. This survey, along with patient, guardian, and visit characteristics, were then analyzed in cross-section and longitudinally (Chapter 4) finding that while no patient or guardian characteristics were related to attendance, the type of appointment, when it was scheduled, the type of provider, and specific beliefs about susceptibility and illness prevention related to attendance across all visits. In the randomized trial and observational analysis (Chapter 5), Health Call had no effect overall. Nonetheless, for the small group of participants who actually received the reminders, it did lead to significant

improvements in attendance. Finally, the in-depth interviews (Chapter 6) with patient guardians and health care staff revealed that fluid family resources, situational constraints, and alternative healthcare options factored heavily into patient attendance but that the staff who controlled the allocation of health system resources, particularly referral appointments, discounted these "flawed" models instead presuming that educating patients about the value of appointments and reminder systems could improve attendance. In addition to the results of each study, which are presented elsewhere, several cross-cutting themes emerged over the course of the research. These are presented below.

Context is important. The myriad of studies on patient attendance put forward many different theories on why patients do not attend appointments. Importantly, some of these results are likely products of specific investigational techniques in specifics settings. Even in this study, which utilized multiple data sources, incorporated thousands of health system contacts, and used a range of quantitative, psychometric, and qualitative methods, still had many limitations that significantly impact its generalizability to other contexts or practices. From the referral process, to the insurance mix to the health system constraints, the coherence with other studies or lack thereof reflects a combination of salient determinants of attendance, the dynamics unique to Chile's health system policies and practices, how they changed even over the course of the study, as well as limitations of the research methods. Thus, the lesson learned is that studies need to be very carefully and intricately shaped by local context characteristics.

Ideal use can differ dramatically from real use. The failure of the reminder system to improve attendance overall in the trial and at scale likely indicates an over estimation of anticipated impact and under appreciation of the other intervening factors. Implementation of the calling system was imperfect during the trial and at scale, largely because a lack of accurate contact information hampered reminder delivery. When delivered, few patients completed the screening questions and subsequently received the reminder. In the rare cases when the reminder was delivered correctly, the system did reduce the number of missed appointments. Taking steps to bridge from efficacy to effectiveness of reminder systems remains a challenge for future implementers.

Health system decision-making is asymmetrically distributed. Certain key stakeholders play important roles in determining patient attendance and therefore in controlling the allocation and use of health system resources. The alignment, or lack thereof, of staff values and practices to health system policies impact tens of thousands of health system contacts at HLCM every year. Further, individual staff initiatives to improve attendance, which are inconsistently applied, potentially exacerbate the unequal distribution of resources, and obscure true associations between observed characteristics and subsequent attendance. Accordingly, data collection and analysis techniques may have missed opportunities to appreciate and assess their influence more widely.

Not all data collected is relevant and not all decision-relevant data is derived empirically. Where illness at one time point is the key criteria for referral in the health system, for guardians, deciding on attendance is a more complex process. In practice,

caretakers are balancing multiple priorities and obligations, and the constraints they face are largely unknown to the health system. That measured characteristics in several of these studies did not relate with attendance likely also reflects inadequate measurement of these characteristics combined with a lack of measurement of other, potentially important variables. These characteristics are also changing over time, meaning some measured characteristics may be significant but only when measured at the decision-point. Identifying when these decision points occur and what capturing what data is relevant to decision-makers presents an important challenge to collecting relevant data.

Behavior over time may differ from behaviors at any time point. An under evaluated factor in this investigation is change in behavior over time. Many analytic methods employed here froze characteristics that could be fluid. The health system employs a similarly static conception by capturing data at referral then outcome at attendance. Meanwhile, for the patient and their family, changes in actual or perceived disease severity, guardian, household or community characteristics, values, and other decision-relevant factors evolve over time. Given the significant wait-times experienced by some patients, evaluation and intervention methods should recognize important changes might have occurred to patients and families between initial referral and follow-up appointment.

Study Strengths and Limitations

Strengths

Many previous evaluations of patient attendance and interventions to improve attendance have had limited generalizability due to their focus on homogenous or high-income patient populations, inclusion of few patient, guardian or visit characteristics, or single method evaluation approaches. The mixed-methods approach of this study allowed for the exploration of multiple dimensions of pediatric patient attendance. The research questions posed by this study as a whole have been answered by quantitative or qualitative approaches but, particularly where analyses showed unexpected or negative results, incorporating the complementary perspectives gleaned from the other data collection methods proved very valuable. While challenging to implement, the mixed-methods design provides richer and more complete data for each participant. This feature of the study allowed for multiple types of analyses to be run on a single cohort instead of comparing different methods across different cohorts.

This study's methodology incorporated both efficacy and effectiveness data. For example, where the randomized trial data initially revealed no results, the observational trial combined with in-depth interviews allowed for a deeper understanding of the trial results and how they actually manifest at scale. This distinction between ideal and real-world data may also be true for other variables that were expected to be more closely tied with attendance, like FONASA, or health beliefs that were not found to be statistically significant in the analysis. While some negative results may reflect important limitations of the analytic approaches used here, other results that were consistently negative across

multiple evaluation methods likely reflect true and important negative associations. Particularly in comparison to the many prior studies in other settings, lessons learned from this study may challenge many prior conceptions of patient attendance.

Finally, this study was developed specifically to address a problem identified by the health system but incorporated analysis that is relevant to a variety of public sector, academic, and industry partners, stakeholders, and organizations. The collaborative private-public-research nature of the study helped to steer research design and produce data-from providing longitudinal details on patient attendance at HLCM, to feedback on the Health Call intervention, to new theories on patient attendance- that serve the multiple goals of the study partners. In lieu of consecutive studies, this approach helped produce some relevant data in parallel, which may enable more efficient and effective movement toward improving patient attendance at HLCM and in Chile as a whole.

Limitations

While some formative work occurred before the start of the study, multiple aspects ranging from enrollment to data analysis revealed mismatches between expected and actual processes, or between expected and available attendance and demographic data. The interviews conducted as part of the study were highly useful not only in contextualizing and complementing quantitative results but also in highlighting challenges to the research design. Follow up studies could conduct a formative study to more prospectively address challenges. Interviews combined with a test analysis could be performed to determine potential issues with data collection and the limitations of

existing data before the formal study starts. While sample datasets were provided during study development, it is clear in retrospect that some of these data points, including key variables like severity or wait time, were actually only available for a minority of patients.

The results from the analyses, particularly the longitudinal and randomized trial, indicate important population and data collection shortcomings. In particular, few patient and guardian characteristics were collected and even fewer pertinent household characteristics. No data was collected on private care, guardian care utilization or population level data that could assess generalizability. Better information on the household resources, whether collected directly from electronic health records or through a revised version of the survey, would make a useful addition to future research. As outlined previously, there are many trade-offs with regard to increasing data collection including increasing pressure on already stretched staff and increasing the time spent by participants at care facilities. Thus, more complex strategies on deciding what data and when to collect it will be an important part of any future studies.

Slow enrollment of study participants also may have impacted data quality. Multiple revisions to the recruitment procedures were implemented in order to increase enrollment in the study, ranging from providing more succinct consent documents to shortening the questionnaire from several pages to a half page, to reformatting the health beliefs questionnaire to fit on one page. Other limitations related to the initial enrollment approach, which required a data collector to be present to enroll guardians. With 16

facilities spread across a wide geographical region and the low per facility referral rate, the process was changed to allow participants to self-enroll at the facility and complete the questionnaire themselves or complete enrollment over the phone. Participation increased significantly using this approach. However, even with Chile's reportedly 99% literacy rate (UNICEF, 2012), study data suggested there still may have been some participants who could have found enrollment materials difficult to navigate and may have not been as likely to enroll. These changes in enrollment strategies over the course of the study likely did not influence the quality of objective study data but, they may have influenced in unpredictable ways subjective beliefs or opinions. A single, coherent enrollment strategy that takes into account participant and health system constraints will be essential in future studies.

The lack of study staffing and small study budget also significantly slowed study progress. Due to limited funds and academic requirements related to my MD/PhD studies, I was not able to be in Chile for the entirety of data collection. Accordingly, study staff were primarily volunteers from local Chilean medical schools with the exception of our local study coordinator, Dr. Rafael Alaniz, and myself. While undergoing appropriate ethics and data collection training, these volunteers had important logistical limitations, which likely slowed initial enrollment. Additionally, with many different volunteers participating in the enrollment and questionnaire processes, they likely introduced some level of variability into survey results. While any form of data collection that requires interaction with patients or guardians, whether routine collected by the public sector or by independent data collectors as part of a research study, does

create this variability, a staff working full time at all the data collection processes until the end of the enrollment period may improve quality and enrollment speed in follow-up studies.

Implications for Theory and Practice

This study was designed based on the Health Belief Model and has important implications on how health system issues, like appointment attendance, can be usefully framed. In this study, the conceptual framework was an important starting point, as was suggested by some of the key results yet it was also insufficient. First, the HBM simplifies complex processes. Using the HBM, differences in patient and guardian characteristics or health beliefs might be expected to be associated with differences in attendance when in this study, they rarely correlated with expected changes in outcomes. Second and relatedly, the HBM suggests that a cue, like the Health Call system, can produce an outcome in a predictable way. This study found that Health Call and interventions from around the health system that shared this same input-output-outcome premise were generally ineffective and, in some rare cases, produced counter-productive results. Third, relationships are proposed as fixed and unidirectional when results from this study indicate that the factors, their relative importance, and their relationships actually change over time as needs, constraints, resources, and other factors change. In a simpler setting, the HBM may provide a useful framework but, when attempting to address more complex issues like patient attendance, it doesn't adequately capture real processes or appropriately guide interventions.

Systems Thinking has been proposed as a way to understand the relationships, processes, and actors that make up the health system (Swanson et al., 2012). Systems Thinking proposes that health systems are Complex Adaptive Systems (CAS). A CAS is an interactive group of individual actors that change over time in relation to each other and their underlying context (Paina & Peters, 2011; Swanson et al., 2012). Compared with more static linear conceptions of health processes and systems, Systems Thinking takes into account emerging behaviors, non-linear outcomes, key actors, and the implementation context in conceptualizing of system change (Russell et al., 2013; Swanson et al., 2012). Instead of defining components, Systems Thinking defines key characteristics that can be used to understand CAS (**Table 1**).

Table 7.1: Systems Thinking: Definitions and relevance to patient attendance		
Emergence	The components and dynamics of a system arise from the structure of that system and its interaction with other systems.	Attendance decisions are impacted by factors as diverse as transportation, education, safety, work, private sector alternatives and other systems that are often not formally acknowledged yet undeniably influential.
Dynamic, Non-Linear Change	Change is critical; systems adapt constantly resulting in unpredictable, disproportionate, and sometimes temporally distant reactions even to similar inputs.	A uniform intervention, like the Health Call system, can be perceived differently even by similar users. Single experiences with this or other aspects of the public health system can drive future behavior in important ways.
Influential Agents	Components, particularly certain key actors or hubs within system are constantly and interacting checking or amplifying change.	A handful of staff members across the health system influence the allocation and distribution of appointments. Their values and decisions become health system policy.
Context Reflects History	Outcomes in a system are influenced not only by the input but also by the implementation context and history.	The factors that are important for attendance vary by context just as the impact of an intervention like a reminder system may work for one group in a certain context but not for another in a different time or place.
Adapted from Paina and Peters and De Savigny and Adam (De Savigny & Adam, 2009; Paina & Peters, 2011).		

New case studies, methods, and theory from CAS and Systems Thinking have been the feature of several recent journal series (American Journal of Public Health, 2006; BMJ, 2001; Health Policy and Planning, 2012; Journal of Evaluation in Clinical Practice, 2009; Tenbensel, 2013). These ideas have already been applied to healthcare from clinical care and training, to donor strategy and goal setting to health system strengthening and evaluation indicating their growing acceptance amongst implementers, evaluators, and theorists (Agyepong, Kodua, Adjei, & Adam, 2012; De Savigny & Adam, 2009; Downe, 2010; Frenk et al., 2010; Korten, 1980; Pfeiffer et al., 2012; Swanson et al., 2012; West, 2012; Williams & Hummelbrunner, 2010; Willis, Mitton, Gordon, & Best, 2012; World Bank, 2007; World Health Organization Maximizing Positive Synergies Collaborative Group, 2009).

Systems Thinking methods share a few guiding principles. First, participatory learning amongst key, implementation level, stakeholders must occur over time. As patients, providers, and the health system change and adapt, so to will the resources and potential impact of existing or planned interventions. Those closest and most influential can provide highly useful insight into existing processes and problems. Second, action must be taken across sectors to create change. For example, improving attendance will likely require wider societal engagement around household constraints, health system access, societal values, and professional expectations. Finally, triangulating impact by using multiple sources of data from multiple perspectives and traditions can usefully identify key issues. Adapting data collection systems to provide key data sources at key decision points to key stakeholders can rapidly augment intended changes (Chunharas, 2006;

Rodrigues et al., 2015; Russell, Swanson, Atun, Nishtar, & Chunharas, 2014).

Policy and Program Recommendations

This investigation generated several specific recommendations related to policy leadership, data collection strategy, and ongoing monitoring and evaluation. The application of Systems Thinking tool could be an important step implementing these recommendations.

Multi-sectoral collaboration

Given the contributions of multiple sectors and stakeholders to attendance, an equally diverse group of actors should be assembled to contribute toward any efforts to improve attendance. Ideally, this group should include guardians, schedulers, policymakers, clinicians, academics, tech developers, transit administrators, hospital administrators, and potentially others involved with the attendance process. Using Systems Thinking methods and approaches as well as iterative dialogue, this group forms a hub through which planning, implementation, and evaluation are coordinated. Implementation of this approach requires not only adjusting guiding principles but also creating spaces where stakeholders can come together to learn and share without judgment or hierarchy. However, once implemented, it can generate important insight for the health system quickly identifying issues or opportunities for new interventions, guiding adapting to emerging health challenges, and effectively mobilizing concerted action amongst pertinent constituent groups(Pfeiffer et al., 2012; Swanson et al., 2012; World Bank, 2007). Examples from Thailand and elsewhere illustrate several ways in which these

groups have been effectively created and maintained (Melgaard, 2004; Tangcharoensathien, Wibulpholprasert, & Nitayaramphong, 2004; Thamarangsi, 2012; Wasi, 2000; Woratanarat & Woratanarat, 2012).

Strategy-driven policy

With multi-sectoral leadership in place, the next step should be developing a strategic plan for improving appointment attendance. This plan should start with an improved understanding of the implementation context. Approaches like Concept Mapping which uses statistical and pictorial exercise to define an implementation context, Social Network Analysis which studies the flow of information and resources to elucidate system relationships, and System Dynamics modeling which uses multiple data sources and experts from multiple sectors to simulate potential policy outcomes are examples of approaches that have been used to address issues as diverse as maternal healthcare reform in Mexico, trauma care in the United States, and the global eradication of polio(De Savigny & Adam, 2009; National Cancer Institute, 2007; Swanson et al., 2012; Williams & Hummelbrunner, 2010; Willis et al., 2012).

The next phase should focus on improving monitoring and evaluation. Three foci are appropriate here. First, existing data collection should be improved both by updating existing data more frequently and by improving the completeness of collected data points. Second, new data should be considered. During this investigation, additional data including household, guardian, and family resources, contextual constraints related to factors like occupation, transportation, safety, and alternative providers options, as well

as health beliefs are types of data points that could be considered. Finally, these data sources should be integrated across both clinical and demographic patient databases to allow for assessment of attendance relative to key variables like diagnosis, severity and wait times. The Performance of Routine Information System Management (PRISM) framework and others can provide a framework for developing and collecting key indicators (Aqil, Lippeveld, & Hozumi, 2009; Plaza, Giusti, Palacio-Mejia, Torres, & Reyes, 2010).

New methods for identifying and assessing interventions

Finally, with new interventions should be considered for reducing missed appointments. Results from this study indicate the critical role of context in determining the impact of interventions on attendance. Especially as the evidence for electronic and mobile technologies expands, HLCM and the Chilean health system will continue to face pressure to adopt new or existing interventions. Their ability to quickly pilot and assess interventions will be an important aspect of improving patient attendance.

Three areas should be considered for improvement. First, the same type of multi-sectoral group described above should lead consideration and evaluation of new interventions. In addition to helping identify clear problems from the outset, this group will play an important role in developing suitable data collection methods, developing context relevant indicators, implementing the evaluation, and assessing results. Second, and relatedly, new types of evaluation methods should be considered. Step-wedge trials, cluster randomization, factorial designs, and others may provide decision-relevant data in

a shorter time frame. Finally, HLCM and the health system should consider continued direct involvement with intervention development.

Conclusion

Chileans consider health to be one of their top priorities but, over the past few years, satisfaction with the health system has been declining toward its lowest level in ten years(Bossert & Leisewitz, 2016). Michelle Bachelet, Chile's President and a pediatrician, has set an ambitious agenda for her 2014-2018 term, including the construction of new facilities, improvements in specialty care, and improvements in coverage. This makes it an opportune moment not only for galvanizing improvements in pediatric care but in referral care as a whole(Oficina de la presidenta electa, 2014). Given the complex nature of pediatric patient attendance, these collaborative, iterative, and adaptive approaches promoted by Systems Thinking and complexity, science may offer useful principles and practical approaches for addressing the attendance issues that the Chilean Health System faces.

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Curriculum Vitae

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EDUCATION

2007-2016 **JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE,** MD

2007-Present **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH,** PhD Candidate

2002-2006, **BROWN UNIVERSITY,** ScB (Neuroscience)

RESEARCH EXPERIENCE

June 09 –Present **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH: INVESTIGATING INTERCONSULTAS: A MIXED-METHODS STUDY OF PEDIATRIC PATIENT ATTENDANCE IN SANTIAGO, CHILE,** Student Investigator
Santiago, Chile • Project lead on a mixed-methods study investigating characteristics and health beliefs associated with missed appointments and assessing the impact of appointments reminders on patient attendance at an urban pediatric referral hospital in Santiago, Chile. Duties include study design, implementation, and analysis.

April 10 –Mar 13 **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH: UGANDA POST-FLOOD AND LANDSLIDE ASSESSMENT**, Student Investigator
Butaleja/Baduda, Uganda• Assisted with preparing data collection process, trained data collectors, led daily data collection, and participated in data analysis and preparation for publication.

April 08 –June 2011 **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH/AFGHANISTAN MINISTRY OF PUBLIC HEALTH: NATIONAL HEALTH SERVICE PERFORMANCE ASSESSMENT,** Regional Director and Student Investigator
Kabul, Afghanistan • One of six Regional Directors for the National Health Services Performance Assessment in Afghanistan. Duties included survey design, troubleshooting and national survey implementation. Currently developing manuscript based on collected data.

July 07 –Jan. 08 **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH: CENTER FOR REFUGEE & DISASTER RESPONSE,** Research Assistant
Baltimore, MD • Assisted in developing global vulnerability map for natural disasters which is used to assess global disaster risk.

PROFESSIONAL EXPERIENCE

Aug 08 –Present **EMPOWERMENT HEALTH,** Co-Founder, Board President
Baltimore, MD •Founded international health 501(c)(3) non profit dedicated to improving maternal and child health. Lead or co-lead for all US and Afghanistan based staff and organizational functions including implementation and evaluation of a community health worker program that serves nearly 500 families, hiring and training of executive team, Board, and interns, fundraising, and professional development.

Jan 14 –Present **ARANCIBIA FELLOWSHIP for HEALTH, TECHNOLOGY, and SOCIAL CHANGE,** Founder and Director
Chile• Lead executive team composed of the Dean of the Univ. de Chile School of Public Health, Director of Hospital Luis Calvo Mackenna, CEO of Merlin Telecom, Director of the JHU Global mHealth Initiative, and the Arancibia Fellow in developing, piloting, and implementing a novel health technology intervention to improve pediatric oncology care in Chile.

June 14 –Present **INGENIUS PREP,** Medical School Graduate Coach
National •Advise medical school applicants on the admissions process, revise application material, perform practice interviews, and develop admissions counseling materials. Recognized as the most productive company employee.

Aug 14 –Present **JOHNS HOPKINS BLOOMBERG SCHOOL OF PUBLIC HEALTH: A STUDY OF CHRONIC DISEASE CARE AND OUTCOMES IN CHILE**, Co-Director
International • This multi-university, US-Chile collaboration seeks to use electronic health records from more than one-third of Chile's population to understand chronic care delivery and identify individual and clinical-level factors that influence health and care utilization.

Sept. 07 –June 11 **JOHNS HOPKINS OFFICE OF PRE-PROFESSIONAL PROGRAMS AND ADVISING,** Admissions Advisor
Baltimore, MD •Advised undergraduate premed student at Johns Hopkins on both MD and MD/PhD admissions through panel presentations, individual counseling, and drafting of committee letters.

July 08 –Jan. 11 **AA ABROAD,** Contributor
Online • Assisted with development of AA Abroad, a travel website dedicated to African-American travelers. Wrote several travel guides and provided advice to the founder as needed.

Dec.07 –Dec. 10 **COMMUNITY CARE INITIATIVE,** Co-Chair
Baltimore, MD •Co-organized annual health fair composed of 40 booths featuring volunteers from multiple health professions and local health organizations. Each year between 300 and 500 residents of East Baltimore attended the fair.

Dec. 07 –Dec. 10 **AMERICAN COLLEGE OF PHYSICIANS,** Maryland Chapter Student Committee Member
Baltimore, MD • Developed the ACP Health Policy Internship Program, a fully funded national health policy internship program for medical students, residents or fellows based in Washington, DC. Led student programing including development of community outreach activities, and other education initiatives across Maryland's health professions schools.

July 09 –July 10 **STUDENT NATIONAL MEDICAL ASSOCIATION,** Health Policy and Legislative Affairs Committee Member
Baltimore, MD • Member of national committee dedicated to coordinating advocacy and outreach efforts for SNMA.

July 07 –May 09 **JOHNS HOPKINS SCHOOL OF MEDICINE,** BRIDGES Representative and Student Admissions Advisor
Baltimore, MD • Delivered workshop at Brown University on admissions for under-represented health professions applicants. Advised several prospective applicants to JHSOM on admissions including revision of application materials and preparation for the interview process.

Aug 06 –July 07 **GLOBAL HEALTH THROUGH EDUCATION, TRAINING & SERVICE,**
Development and Program Officer Attleboro, MA • Developed and executed comprehensive fundraising plan for 501(3)(c) international health non-profit. Organized several international medical training exchanges and coordinated African Association of Health Institutions and other groups around the world.

June 06 –Aug. 06 **SENATOR BARACK OBAMA & THE KAISER FAMILY FOUNDATION,**
Barbara Jordan Health Policy Scholar Washington, DC• Researched health related policy and constituent issues. Prepared memos on congressional hearings, briefings and legislation. Co-wrote Sen. Obama's speech on stems cells, drafted portion of bill submitted to Congress, and wrote policy memo on HIV/AIDS prevention in South Africa.

AWARDS AND HONORS

EMERGING CLINICIAN LEADER, National Summit of Clinicians for Healthcare Justice
FEATURED ARTIST, Armstrong Medical Education Building, Johns Hopkins School of Medicine
GIBBONS AWARD, American Congress of Obstetricians and Gynecologists, Johns Hopkins Hospital Chapter
MEDICAL SCIENTIST TRAINING PROGRAM, National Institutes of Health
PHILIP MACKOWIAK STUDENT ACHIEVEMENT AWARD, American College of Physicians, Maryland Chapter
PAUL AMBROSE POLITICAL LEADERSHIP INSTITUTE, American Medical Student Association
STUDENT OUTREACH RESOURCE CENTER, Community Service Appreciation Award

PUBLICATIONS (Previously published as Evan Russell)

DOOCY, S., **RUSSELL, E**., GOROKHOVICH, Y. & KIRSCH, T. 2013. Disaster preparedness and humanitarian response in flood and landslide-affected communities in Eastern Uganda. *Disaster prevention and management,* 22**:** 326-339.

RUSSELL, E., JOHNSON, B., BUEHNER, H., NOVILLA, L., VAN OLMEN, J. & SWANSON, R. C. 2013. Health systems in context: a systematic review of the integration of the social determinants of health within health systems frameworks.*Rev Panam Salud Publica,*34(6):461-7.

RUSSELL E, SWANSON RC, ATUN R, NISHTAR S, CHUNHARAS S. 2014. Systems thinking for the post-2015 agenda. *The Lancet*; 383(9935): 2124-5.

SENTHIL K, **RUSSELL E**., LANTOS H. 2015. Preserving the Social Contract of Health Care-A Call to Action Systems. *The American Journal of Public Health*; 105(12): 2404.

RUSSELL, E. (In press). The implementation of an IT system to improve appointments in an urban pediatric hospital in Chile. In S. Chunharas, Tacit Knowledge in Health Policy and System Development. Alliance for Health Policy & Systems Research (WHO).

PRIVATE CONSULTANCIES

May, 2014 **CLINICA INDISA.** Santiago, Chile.
•Analyzed data from more than 1,000,000 clinical visits across multiple healthcare contexts to develop a multi-level model patient attendance as well as a predictive model for anticipating future missed appointments. This algorithm is currently being used by this health system to reduce missed appointments and boost clinical output.

March, 2014 **INTEGRAMEDICA.** Santiago, Chile.
•Developed quantitative indicators of patient satisfaction and attendance patient attendance using medical records and quantitative interview questions from over 500,000 patients spanning five urban hospitals. These indicators are currently being used to improve quality of care and clinical efficiency.

Sept, 2013 **DISCOVERY HEALTH.** Latin America.
•Using national and international nutrition standards as well as scholarly literature, developed an algorithm for assessing the appropriateness of packaged foods for pediatric consumption. Labeling based on this algorithm will be used as part of their upcoming healthy eating campaign across Latin America.

ORAL PRESENTATIONS

Dec. 12 **mHealth Summit**
• "Strategic Partnerships for eHealth: Accelerating Health Innovation Through Collaboration Across Public, Private, and Research Institutions"

Nov. 12 **American Public Health Association Conference Boston**• "A Participatory Focus Group Discussion of Maternal and Child Health Concerns and Priorities in Two Districts of Kabul, Afghanistan" (Accepted but not delivered)

Nov. 11 **3RD mHEALTH NETWORKING CONFERENCE**
• "New Partnerships for mHealth: Creating Collaboration Across Public, Private and Research Institutions"

MEDIA

• Nov. 16, 2010 Ignite Hopkins. Discussed the founding process for Empowerment Health
• July 28, 2008 Peter B. Collins Show (radio). Interviewed regarding politics and health in Afghanistan
• Interviewed by Associated Press/CNN/Washington Post/others on murder of Empowerment Health collaborator in Afghanistan

LANGUAGE

English-Native
Spanish-Professional